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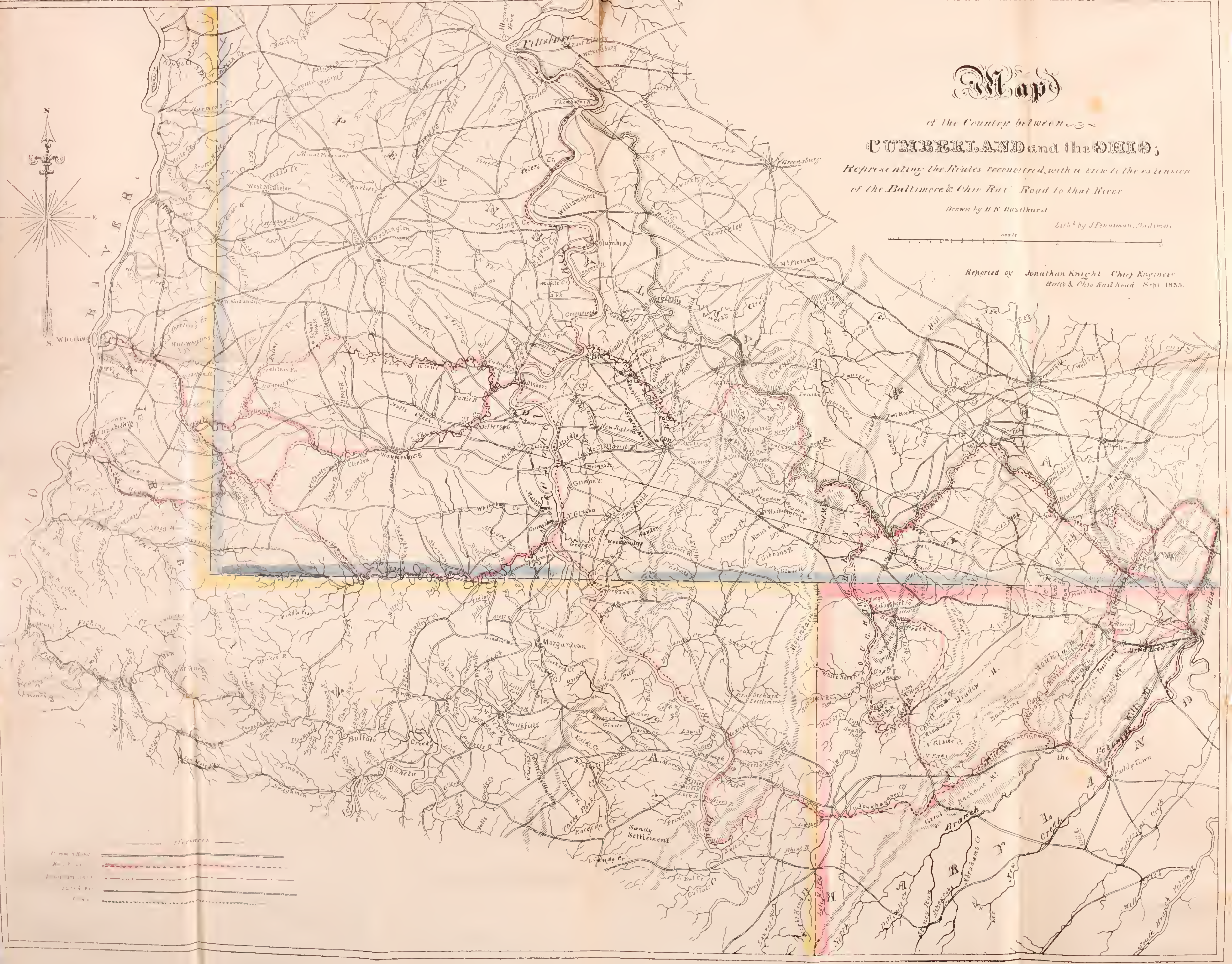
Map
of the Country between
CUMBERLAND and the OHIO;
Representing the Routes reconoitred, with a view to the extension
of the Baltimore & Ohio Rail Road to that River
Drawn by H R Hazelhurst.
Lith.d by J Penniman, Baltimore
Scale
Reported by Jonathan Knight Chief Engineer
Balt. & Ohio Rail Road Sept 1835.
Pittsburg
Greensburg
Washington
Williamsport
Columbia
Waynesburg
Jefferson
Morgantown
Smithfield
Kingwood
Sandy Settlement
Cumberland
N. Wheeling
RIVER
OHIO

NINTH

ANNUAL REPORT

OF THE

PRESIDENT AND DIRECTORS

TO THE

STOCKHOLDERS

OF THE

BALTIMORE AND OHIO

RAIL ROAD COMPANY.

BALTIMORE:
PRINTED BY WILLIAM WOODDY,
No. 208 Market street.

1835.

NINTH ANNUAL REPORT.

THE time has again arrived, when it becomes the duty of the President and Directors to lay before the Stockholders, the proceedings of another official year. During this period, the main stem of the road has been completed to a point opposite the town of Harper's Ferry, and the branch to Washington has been opened for general travel. Various improvements have been made in the machinery and motive power; and additional views have been suggested by the changing circumstances and increasing ramifications of the system of internal improvements now prosecuting in all directions throughout the country. The purpose of the present report will be to present these various matters in order and in detail.

At the date of the last annual report, the graduation of the main stem, between the Point of Rocks and Harper's Ferry, was drawing to a close; and soon after, the difficult passes of the Potomac, undertaken by the Chesapeake and Ohio Canal Company, and the intermediate portions, let out by the Board of Directors, were simultaneously completed. All possible expedition was used in laying down the rails, and by the 1st of December, 1834, the entire line, from Baltimore to the eastern abutment of Wager's Bridge, opposite the town of Harper's Ferry, was opened, with appropriate formality, for general use. The machinery, necessary to facilitate the transit of flour and other produce from the Canal to the Railroad, was at once erected, and the increase in the business of the Company, which immediately followed, even exceeded the anticipations that had been previously formed, and called for every exertion to furnish

the requisite means of transportation. Notwithstanding the difficulties, which at all times attend the diversion of trade into new channels—the temporary and most inconvenient location of the place of transit, the great height between the Railroad and Canal, the want of proper shelter, the contracted space allowed for labor and handling, where the Canal, the Railroad and the Turnpike are all crowded into a width of less than one hundred feet, and the unavoidable delays in forwarding to Baltimore, which occasionally took place,—notwithstanding all this, the business done from Harper's Ferry continued steadily to increase; and although the total amount was necessarily divided with the magnificent Canal alongside, yet the Board of Directors had every reason to be satisfied with the portion that was given to the Railroad. This state of things has continued up to the present time, during the business seasons, and there is no reason to anticipate that it will not be permanent. The Board must here acknowledge how much is due to the liberal policy of those of the merchants of Baltimore to whom the new trade has been directed, and who are entitled alike to the thanks of the Company and the community, for the efforts which they have made to render this market popular and attractive, in those sections of country where, hitherto, it has been but little known.

Various circumstances prevented the Board, for some time, from taking measures to connect the main stem with the Railroad of the Winchester and Potomac Company. They finally determined, however, to construct a substantial viaduct across the Potomac, on the prolonged trace of the Winchester road, and capable of permitting the passage of locomotive engines, with their usual trains, to which the present bridge is wholly incompetent. Contracts for this purpose have already been entered into, and it is expected that the viaduct will be completed early in the ensuing summer. The piers, six in number, with the abutments, will be of undressed masonry, and the superstructure of wood. Its entire length, including the portion crossing the Chesapeake and Ohio Canal, will be 830 feet. When a permanent connection is formed between the main stem and the Winchester and Potomac Railroad, the Board will, after the experience of a few weeks, be enabled to determine, better than

at present, upon the arrangements to be made to accommodate, to the greatest advantage, both the trade which, descending the Canal, may be bound for Baltimore, and that which may be intended for the same market from the valley of Virginia.

The Winchester and Potomac Railroad Company are now engaged in erecting the southern abutment of the river viaduct, and in the graduation of their road through the town of Harper's Ferry. It is expected that the entire line, from Winchester to the river, will be in readiness for use during the present year; so that, in a short time, there will be an uninterrupted Railroad communication between Winchester and Baltimore, a distance of one hundred and twelve miles, on the most direct route to the cotton growing districts of Tennessee and the South West—pointing towards the great Nashville and New Orleans Railroad, and aiming at very near the centre of the James River and Kenhawa improvements. The extension of the Railroad from Winchester to Staunton is all that is necessary to secure to Baltimore a large portion of the trade of the great valley and the vast region that lies beyond its western boundary.

The views heretofore expressed by the Board of Directors, in regard to the business that would be created by the road along its course, have been fully realized; and there is daily evidence that its advantages are not confined to its *termini* alone, as was once supposed would be the case, but that these advantages will extend to the country on either side. The increase of the receipts of the transportation department is the best criterion by which to judge of the value of the work, as well to the public as to the stockholders; and by referring to the report of the proper officer (see Ap. doc. C.) it will be found that the receipts of the present year, exceed those of the last year by the sum of $57,931.62, while the expenses have only increased $23,341.98 during the same period. The gross revenue of the year ending October 1st, 1835, is $263,368.10; the expenses for the same period are $156,204.39, leaving a nett revenue of $107,163.71.

Of the expenses of transportation, a very large portion is rendered necessary by the four inclined planes at Parr's Ridge. When the main stem was originally located, it was designed to

pursue the only plan then known, and to effect the passage of the ridge by means of stationary engines; and, in the mean time, horse power was used as the most economical within certain limits. Since then, however, the performances of the locomotive engines, built by the Company, have proved that it is perfectly practicable to construct a Railroad across Parr's Ridge, upon which locomotive engines with their usual trains, may pass in either direction, without the assistance of stationary power, being aided, when necessary, by extra locomotives kept on the section for the purpose. The great saving, both in time and expense, which will result from the change thus suggested by the recent improvements of the machinery of Railroads, has made the relocation of the road at the Ridge a prominent subject of consideration with the Board, and it will be one of the objects claiming their early attention.

Among the items of expenditure, that of repairs upon the main stem has been a heavy one, and will continue to be so. It must be understood, however, that these repairs relate to the rail track alone, the masonry, upon recent inspection, having required but a trifling renewal of the pointing, here and there, to make it as perfect as the day it was completed, (see Ap. doc. F.) and the graduation generally requiring but little attention to keep it in good order. In the outset of the undertaking, the costliness of the English rail prevented its being adopted; so that, without any thing to guide them, the Board of Directors had to experiment upon such materials as were at hand. The wooden string piece and sleeper, with a plate rail of $2\frac{1}{4}$ by 5-8 inches, were first laid down: then stone blocks were substituted in place of the wooden sleeper; then the log rail was used; and then the continuous stone string piece was devised and considered as the perfection of the system. Experience proved that of these four modes, the first was decidedly the best, and the last, decidedly the worst, of all. Under such circumstances, and when it is considered too, that in the haste of construction, indifferent timber had often to be used, and, sometimes, even laid down green from the adjacent woods, it is not to be wondered that the item of repairs should be considerable. Great care, however, is now taken, to employ none but the

best materials in renewing the unsound portions of the railway, so as to reduce, before long, this item to its minimum.

Another item of expenditure, which the Board hope will be but temporary, grows out of the necessity of either dispensing with the use of steam from the Point of Rocks to Harper's Ferry, or building a board fence along a portion of the distance, between the Railroad and Canal, so as to hide the Locomotive Engine from the horses tracking boats on the towing path. The act of the Legislature of Maryland, upon which the agreement with the Canal Company for the construction of the Railroad to Harper's Ferry was based, contained a clause to the above effect, inserted at the instance of the Canal Company, under the apprehension that the noise and unwonted sight of the engines, would alarm the horses and occasion accidents. The erection of the board fence, which would make the Railroad a great ditch for the snow and wash from the hills, being out of the question, the Board have been obliged to dispense with the use of steam, and keep up a stock of horses for the distance in question. It is hoped, however, that the Canal Company will consent to remove the restriction here alluded to, inasmuch as the experience of the transportation on the Baltimore and Ohio Railroad, where steam and horses have been long used at the same time, and are constantly meeting on adjacent tracks, shews the objection to be unfounded, and the danger to be imaginary. While on this subject, the Board cannot suffer the opportunity to pass, without stating that the kindest feeling prevails between the two Companies, and acknowledging the liberal facilities afforded by the Canal Company in the construction of that part of the viaduct at Harper's Ferry which crosses the Canal.

Soon after the publication of the last annual report, the Board of Directors caused that portion of the Washington branch, within the District of Columbia, to be put under contract as far as the City boundary; and upon the meeting of Congress, they made application to that body to remove the restriction confining them to the lines of the streets as laid down on the City plat. This was not granted until the close of the session; and the negotiation with the corporate authorities of Washington, in

order to fix the precise route, although facilitated by them in the most liberal and friendly manner, having created a still further delay, it was not until late in the spring that the contractors could commence operations within the City. Notwithstanding, however, the entire line from the main stem to the Pennsylvania Avenue, was formally, and with suitable ceremonies, opened for travel on the 25th of August, a portion of it, as far as Bladensburg, having been in use from the 20th July previous. (See Ap. doc. B.)

In the agreement entered into with the corporation of Washington, it is stipulated that the road shall be extended across the Pennsylvania Avenue, and passing into Missouri street, reach the Chesapeake and Ohio Canal at the Basin on Sixth street. This would have been done at the same time with the rest of the work, but for the want of authority to pass over a public reservation lying in the route. As soon as this difficulty is removed, the stipulation above mentioned will be complied with.

The natural obstacles to the construction of the Washington branch, have been unusually great, owing to its course lying at right angles with the direction of the streams; occasioning heavy cuts and embankments alternately throughout nearly the whole distance. In all cases, viaducts of plain yet solid masonry have been built; and, in the adoption of a form of rails, the experience acquired on the main stem has been referred to, with a view of making it as perfect as practicable. It is highly gratifying to the Board therefore, to be able to state, that the cost for graduation, masonry, and construction, of the branch, allowing for the expense of laying down a second track of rails, will fall short of the original estimate upon which it was undertaken about $60,000. The great viaduct across the Patapsco falls also within the estimate, including all attendant expenses. The obelisk, erected at its northern extremity, is a memorial, placed there, at his own expense, by the able and enterprising contractor, John M'Cartney, of his connection with a work which is, as yet, the most extensive of its kind in this country.

Nineteen miles from Baltimore, the Savage Railroad diverges from the Washington branch, and leads to the Savage Factory, and to most valuable quarries of granite in the neighbourhood. The Company, by which it was made, was incorporated

at the last session of the Legislature, and they have prosecuted their work with commendable zeal and efficiency. It is now nearly finished as far as the factory, and will soon add, not inconsiderably, to the business of the branch.

Since the opening of the Washington road, the travelling between the two cities has greatly exceeded that which the stages and other modes of conveyance formerly accommodated at the same season. The average, at this time, is about two hundred persons per diem; and it is found that numbers, to the south of Washington, who formerly came to Baltimore by the Bay route, now ascend the Potomac and make use of the Railroad. The Board have every reason to believe, that the results of the Washington branch will fully justify the policy of taking the greater part of the stock on account of the Company.

The distance between the two cities is now performed by the Locomotive Engines, in about two hours and ten minutes, which is at the rate of near twenty miles an hour. When the portion of the main stem common to the Washington branch, between the first intersection with the Turnpike road and the Deep Cut, shall be made less curved than at present, which is contemplated, and can be easily effected, there is little doubt that the time of making the journey will be brought within the limit of two hours as originally proposed.

As yet, with the exception of the deep cuts, there is but a single track of rails on the branch road. It is the intention of the Board, however, to take steps to lay down the second track in time to accommodate the now daily increasing travel and transportation.

The increased and rapidly increasing operations of the Company have rendered it necessary to add largely to its real estate, both in Baltimore and in Washington. The Mount Clare depot, containing ten acres, and presented to the Company by the late James Carroll, Esquire, having been found insufficient for the purposes connected with the business of the road, to which it is appropriated, the Board have recently purchased about 11 acres of the ground lying south of, and binding on Pratt street, and immediately east of, and adjoining to this property, by which the entire quantity owned by the company there, is in-

creased to about 21 acres of land. Squares No. 718 and 632 and the half of square No. 574, have also been purchased in Washington, for the purpose of establishing a depot and other necessary accommodations in that city, as has also been a lot on the Pennsylvania Avenue, at the angle where the Railroad intersects it. On the latter property there is erected a convenient three story brick house, now occupied as a ticket office, and also a commodious car-house. The wants of the Company have rendered it necessary to enlarge the foundry at the Mount Clare depot, and to appropriate for a boiler shop the car house first built there. An engine house, with accommodations for nine engines, has been erected upon an approved and satisfactory plan—a large car house, of wood, containing three tracks and one hundred and fifty feet in length, has also been built, and another, of brick, two hundred and eight feet long, is now in progress, as is also a new smithery and repairing shop. When the number and value of the passenger cars belonging to the Company are considered, these arrangements for their safety and preservation, will not be thought superfluous.

An arrangement has been made with the Water Company, for an ample supply of water at the Mount Clare depot, where the well water was found to produce a deposit injurious to the boilers of the engines. Arrangements have also been made for water stations along the line of the Washington branch, and on the main stem, and permanent and convenient fixtures are now being erected at the proper points, to secure, at all times, a prompt and ample supply.

With the machinery and motive power employed by the Company, there is every reason to be satisfied; and the results of experience confirm the Board of Directors in the belief, that the engines used by them, differing as they do essentially from the English engine, are not only better adapted to the curves of the main stem, but are more powerful, with equal velocity, on the comparatively straight and level branch road to Washington. The principle of these engines has been fully explained in former reports. Numerous improvements in the details of construction, have been made during the past year, aiming at simplicity and durability; and there is little doubt that results, which are now daily furnished on the Washington branch, will, before long, give the constructors of the Company's engines the same

advantages, which the experience of the Liverpool and Manchester road has afforded in the workshops of England. The anthracite coal continues to be the only fuel employed, and is found to be far preferable to any other. The heat is intense—the fire requires replenishing but seldom—no smoke is emitted, and no sparks are produced, to the peril of the clothes of passengers, baggage or merchandize. Neither is it observed that the fire bars are less durable, or require renewing oftener, than in engines where either wood or coke is used.

In the last annual report, the power of the "Arabian" locomotive engine, was mentioned; and it was stated that it had drawn upwards of 112 tons on a level at the rate of near twelve miles an hour, and the same weight up an ascent of 17 feet per mile, occurring on a curve of 1000 feet radius, at the rate of 6½ miles an hour. Afterwards, in December, 1834, the same engine passed over the planes at Parr's Ridge, ascending two-thirds of a mile at the average rate of 264 feet per mile, with two cars full of passengers, making with the tender 11 tons, exclusive of its own weight of 7½ tons. This experiment with the "Arabian," led the Board to consider the propriety of relocating the road at the planes, as already mentioned, so as to dispense with the use of stationary or horse power there.

The "Arabian" was the first engine built after the adoption of the present plan. It is now in daily use, travelling 80 miles without slacking its fires, or letting its steam get down, and is in perfect order. There are five other engines like it, on the road, and three more will, in a short time, be completed, and ready for use.

On the 26th of September last, a load amounting to 113 tons, was attached to the "Washington," a new engine on the plan of the Arabian, weighing eight tons, with a view of making an experiment of the effective power of the Company's engines on the Branch road. With this great weight, the engine travelled to the city of Washington at a rate, not less, at any place, than ten miles an hour, preserving this, the least speed, up ascents of five and six miles in length of twenty feet to the mile. The train was several times purposely stopped on the ascending grades, and when the steam was again applied, the engine would

steadily regain its previous velocity, and maintain it with apparent ease. The same load was brought from Washington to Baltimore at the same rate. The *average* speed was much greater, and upon the level parts of the road seemed entirely at the discretion of the engineer. The same engine, on a level, exerting the same power, would have drawn 213 tons at the rate of ten miles an hour. During the whole time there was a superabundance of steam. Performances like this, are, it is believed, unequalled in the history of Railroads.

When thus adverting to what has been accomplished in the improvement of the locomotive engines of the Company, it would ill become the Board to omit paying a tribute of merited respect to the memory of Phineas Davis, the lamented individual who so largely contributed to the results here indicated. On the 27th of September last, he, having completed a new engine, availed himself of the occasion of trying it, to take his numerous workmen on a visit to Washington. On his return, the engine, striking the end of a rail, which the breaking of the iron chair had permitted to get out of allignment, it was thrown off the track, and being at the time on the tender, he was dashed forward against the engine and instantaneously killed. No other person was injured.

Phineas Davis was the first, who constructed an engine, capable of being used on the road, in which anthracite fuel was successfully employed. With untiring patience, he bore disappointment after disappointment; and the eminent and splendid results, which ultimately rewarded his efforts, are ample testimonials of his genius, and will identify his name, most honorably, with that great system of internal improvement, which is yet to work so many and such important changes in the relations of society. Of a quick and clear conception, in matters relating to his profession, he possessed a calm discriminating judgment. The warmth and energy of inventive talent were tempered by a prudent foresight and great practical skill. He seldom, therefore, took a step, which was not a secure one; and the success of his suggestions, when put into practice, gave them, from the first, almost the same weight as if they had been the dicta of experience. His private worth and unassuming manners, were

not less remarkable, than his rare abilities. The Board deeply regret his loss, and hold his memory in sincere and respectful consideration.

The eight wheeled passenger cars, mentioned in the last annual report, have been fully tested, both on the Washington branch and on the main stem; and are found to combine safety, convenience, ease of motion, and economy. They are considered far preferable to the common four wheeled cars in all these particulars, and have been permanently adopted by the Board. The same plan has been applied to the burden cars, with equally favorable results.

The machinery, generally, of the Company, has been much improved during the past year. The casting of the wheels has been brought to a perfection which removes all fear of accident from their breaking, even at the highest velocities. The revolving platforms, invented by John Elgar, and used at the Mount Clare depot engine house, are superior to any heretofore constructed. The present breaks for passenger cars, suggested by Evan Thomas, have proved most efficient and durable. A new form of blowing apparatus, combined with a contrivance for heating the water before it is pumped into the boilers, has been invented by Ross Winans, and has produced increased efficiency. In fine, the Board have every reason to be satisfied of the policy of having their machinery manufactured in the shops of the Company, where suggestions, growing out of the experience afforded on the road, can at once be made available.

The number of locomotive engines now in use is seven, of passenger cars forty-four, of which twenty-five are on eight wheels, and of burthen cars one thousand and seventy-eight, of which forty-eight are on eight wheels. (See Ap. doc. D.)

The necessity of providing for the punctual payment of the interest on the loan made to construct the Washington branch, together with a determination to pay off the arrears of interest on loans made to anticipate instalments, during the construction of the main stem, have obliged the Board to postpone, heretofore, the payment of dividends. The completion of the Washington branch, however, now enables the Board to commence,

and to continue without interruption, the payment of semi-annua dividends. And after carrying $75,000 to the debit of prof and loss, to make good deterioration of the railway and ma chinery, they have declared a dividend of one and half per cen for the last six months.

It now remains for the Board of Directors to advert to the relations with other works of internal improvements, and to pre sent such views with respect to the further progress of the Ba timore and Ohio Railroad, as have been suggested during th past year. Plans which, not long since, would have been con sidered as fanciful chimeras, are hourly assuming the shape of effective undertakings; and rapid as have been the stride taken in the improvement of Railroads and their machinery, th possibility of much greater perfection is now even more full admitted than it was in the earliest periods of the system. Railroad which is constructed in an old community, and th passes through a densely peopled region, may have its fortun foretold to it in the outset: but one whose course lies through new land, teeming with all the elements of agricultural and cor mercial greatness, which connnects immense rivers flowing opposite directions, whose rich valleys have been, but recentl in comparison, laid open to the full tide of emigration, such Railroad is found at each step of its progress, involved in ne relations, and it becomes difficult to predict results which futu circumstances can alone determine.

Soon after the publication of the last annual report, applic tion was made to the Board on behalf of a large and highly r spectable meeting of the citizens of Chambersburg, requesti that an Engineer might be deputed to examine the country b tween that city and the main stem of the Baltimore and Oh Railroad, at a point not far below Harper's Ferry. The Boa accordingly directed B. H. Latrobe, Esq., then assistant eng neer in the Company's employment, to perform the required se vice; and he made a reconnoissance of the proposed route, wi a survey of part of it, passing through Hagerstown, leavi Boonsborough to the North, and descending the valley of Israe creek to the Potomac. The entire distance was about 45 miles, t greater portion of which was found to be extremely favorabl

and the average cost per mile for a single track was estimated at $10,000. One inclined plane, however, was found to be necessary to overcome the rapid rise from the margin of the Potomac towards the summit level. No steps have yet been taken in the prosecution of this road: but it is not improbable that, before long, a communication between Baltimore and Chambersburg, by the proposed route, will be effected.

Within the last year, the Baltimore and Port Deposit Railroad Company, whose work unites with the main stem of the Baltimore and Ohio Railroad, at the Eastern part of the city of Baltimore, have commenced active operations, and the graduation as far as the Gunpowder river, is understood to be nearly completed. It is supposed that this road will be finished to Havre-de-Grace during the ensuing year. By the same time, the Railroad now being constructed from Wilmington to the Susquehanna, will also be ready for use; as also the Oxford and Cecil Railroad, which unites with the Baltimore and Port Deposit road at the village of Port Deposit, after passing through Lancaster county, Pennsylvania. Should the Railroad from Wilmington to Philadelphia, and that now in progress across New Jersey, be completed, which there is every reason to believe will soon be the case, there will then be an uninterrupted line of Railroad communication between New York and Washington City.—From Washington to Potomac Creek, steam boats will continue, in all probability, to furnish the means of conveyance for some time: but from Potomac Creek, the Railroad to Fredericksburg, and from thence to Richmond, thence to Petersburg, and thence to the Roanoke, will prolong the system Southwardly, parallel to the seaboard. Of this route it will at once be seen that the branch road to Washington forms one of the most important links. To the westward, the main stem of the road is already at the point of divergence of the great natural highways to the West and Southwest, where the Potomac and Shenandoah unite their waters. The extension of the Chesapeake and Ohio Canal to Cumberland, will afford an early and efficient means of approach towards the West; while the Winchester and Potomac Railroad, now nearly completed, and the Winchester and Staunton Railroad, which there is much reason to believe will

be undertaken before long, will carry the system from Baltimor into the heart of Virginia, and to within sixty miles of Pattons burg, on the line of the James River and Kenawha Railroad so that on the completion of the latter, and the Winchester an Staunton Railroad, both of which events may be considered a not remote, there will be but sixty miles of railroad, in addition to make, over a favorable country, to complete a railroad com munication with the western waters.

Looking still further forward in this direction, and warrante by circumstances that give probability to what would, not lon since, have been considered as morally, if not physically, impos sible, it will be found that the route above indicated affords very direct and feasible means of forming a connection with th New Orleans and Nashville Railroad, and thus perfecting great chain of internal improvements from one extremity of th Union to the other. From Pattonsburg on the James River t Salem, passing near Lexington and Fincastle, the great valle presents a good location for a railroad; and the passage the Alleghany chain, to the waters of New river, near Chri tiansburg, it is understood, offers no difficulties which may n be easily overcome without the use of stationary power. A cending first the valley of New river and then the ravine one of its tributaries in a southwest direction, there is but short distance, and a low summit, intervening between th sources of the Holston, on which is situated Knoxville, Ea Tennessee, at the head of steam boat navigation, not far abo the point where the Holston and Clinch rivers uniting form th Tennessee river. The prolongation of the road down the Te nessee valley to Decatur, would unite it with the Tuscumb Railroad now in operation, and complete a line which must ce tainly be intersected by the Railroad from New Orleans Nashville. It is not at all improbable that before long a Rai road will be made up the Tennessee valley, towards Knoxvill on the route here indicated. To those who doubt the compl tion of the communication thus pointed out, no better answ can be given than to refer to the New Orleans and Nashvil Railroad; which, from being, a brief space since, a mere spec lation, is now under contract, with every prospect of early con

pletion. If, in place of the route here indicated, the lower route, from the Roanoke, through the alluvial country, to New Orleans, should be adopted for the Railroad connection of the North and South, the Washington Branch, instead of the main stem, will receive the travel and transportation, so that the Company will, in any case, derive a full share of the benefits of the undertaking.

In their last Annual Report, the Board expressed their opinion that the true interest of Baltimore and of the state of Maryland, lay in the completion of the Chesapeake and Ohio Canal to Cumberland, and the continuation, beyond that point, of the Baltimore and Ohio Railroad to Pittsburgh and Wheeling, so as to effect that communication with the West, by means of the two works, which had been so long and so anxiously aimed at. During the subsequent session of the Legislature, an appropriation of two million of dollars was made, on behalf of the state, sufficient to accomplish the first part of this design; and it now only remains to provide the means to construct the Railroad across the mountains, to complete the whole. It is hardly to be supposed that Maryland, which, in creating the Baltimore and Ohio Railroad Company, gave the first impetus to the present system of extended Railroad intercommunication, will not go forward as nobly as she has begun, and contribute as largely to the Railroad across the mountains as she has done to the Canal which reaches only to their base. It is the completion of the entire scheme which can alone justify her having embarked in a portion of it; and when that completion depends upon herself, when an increased investment will not only be profitable in itself, but make previous investments, yet more productive, it can scarcely be doubted but that the state, true to her own best interests, will furnish the necessary means.

During the last summer, Jonathan Knight, Esq. Chief Engineer of the Company, was directed, at the instance of the citizens of Wheeling, to make a reconnoissance between Cumberland and the Western waters; and inasmuch as the Charter of the Company from Pennsylvania required that the road, if it entered that state, should be constructed to Pittsburgh, the reconnoissance was extended to the two cities. The report of the Chief Engineer

will be found in the appendix. (See doc. A.) It is full and satisfactory. It proves the all important fact, that the mountains between Cumberland and the Western waters CAN BE PASSED WITHOUT THE USE OF STATIONARY POWER, BY LOCOMOTIVE ENGINES AND THEIR TRAINS: It shews that the roads to both Pittsburgh and Wheeling are perfectly practicable; and that it is to the interest not less of those places than of Baltimore, that both should be made. Each presents its peculiar advantages, pointing to opposite parts of a wide region, and being either in connection or juxtaposition with different systems of internal improvement still further to the West. Indeed, the completion of both is alike necessary to the perfection of the plan of western intercourse, as originally contemplated in the organization of this Company, and which the Board cannot help believing is now speedily approaching its accomplishment; and both should, if practicable, be simultaneously carried forward.

Entertaining the convictions here expressed, the Board have regarded with great interest the steps taken in Wheeling and Pittsburgh, on the subject, and have been highly gratified to find their own views corroborated by the public sentiment of those places. In looking to the means by which both works shall be completed, and considering the mutual interest of the parties in the undertaking, it has appeared to the Board that the expense should be joint: the state of Maryland, the city of Baltimore, and individual subscribers furnishing the portion required to make the main stem to the point of divergence, and Pittsburg and Wheeling furnishing the portions equal to the expected cost of their respective branches. The total expense has been roughly estimated at about $4.600.000, of which Wheeling, some time since, has tendered a subscription of $500.000. The Board of Directors, vital as they consider the subject of western intercourse, must bear in mind, nevertheless, the extent to which the people of Baltimore have already embarked in it, the probability of further contributions from the same source, and the prospect of receiving that aid from the State which is essential to the object. Of the deep interest which Baltimore now has in the undertaking, and which is, in truth, the interest of the State, the Board have spoken fully in their former reports; and they cannot butbelieve, that, when it shall be ascertained that a portion of the capital, equal to the cost of their respective branches, will be

subscribed in the cities of Pittsburg and Wheeling, that the State of Maryland, the City of Baltimore and individual subscribers will be found ready to contribnte the balance. Without some such assurance as is here intimated; without, indeed, being satisfied that the rail road, when once commenced beyond Cumberland, would be finished without delay to the Ohio at Pittsburgh or Wheeling, or both, it would not be advisable to make the commencement; for it is only the connection with those cities, and the trade and travel that would be the consequense, which can justify the undertaking. There are some designs so noble and important, that their mere suggestion is sufficient of itself to render their accomplishment certain, notwithstanding what may appear at the time to be disheartening difficulties. The design of western intercourse here indicated is one of these; and the question now is, not whether it shall ever, and remotely, be completed, for of that there can be no doubt, but whether, by prompt and vigorous action, it shall be urged forward without delay, so as to ensure the advancement of Baltimore to prosperity, *pari passu* with the other cities of the land.

Admirably situated as Baltimore is, at the head of the Chesapeake, and in closer proximity to the valley of the Mississippi than any other of the atlantic cities, all that is necessary to insure her rapid growth in wealth, power and importance, is united effort among her people, aided by the state of which she is the commercial capital. The Susquehanna Railroad from the North—the Washington branch from the South—the Port Deposit Railroad from the East, and the main stem of the Baltimore and Ohio Railroad from the West, may be considered as so many great arteries, whose prolonged extension and spreading ramifications tend to increase and secure the healthy and vigorous growth of the city which may be termed the heart of the system.

For a statement of the receipts and expenditures of the Company during the past year, and for an exhibit of its general fiscal concerns, the Board refer to the report of the Treasurer (See Ap. doc. E.)

By order of the Board of Directors,

P. E. THOMAS, *Pres't.*

October 1, 1835.

APPENDIX.

[A.]

SIXTH ANNUAL REPORT

OF THE

Chief Engineer of the Baltimore and Ohio Railroad.

ENGINEERS' OFFICE, BALTIMORE AND OHIO RAILROAD,
Baltimore, October 5, 1835.

To PHILIP E. THOMAS,
Pres't Balt. and Ohio Railroad Co.

THE time for making the annual statements relating to the affairs of the Railroads in charge of this Company, having arrived, I have now the honor to present my sixth annual report.

It was stated in my report of last year, as probable, that a single track of railway upon the Washington branch railroad, would be opened and travelled from Baltimore to the line of the District of Columbia, by the first of July then next; and it is with unfeigned satisfaction, that I am now enabled to state that the result is in accordance with the belief then entertained: For on the first day of July last, a Locomotive Engine, with a train of cars containing the President, Directors, and other persons, went and returned over the entire space mentioned.

Within the present year the Company availing itself of the legislation of the general government, and of the most friendly and enlightened grants of the municipality of the City of Washington, has pushed forward the work with unfaltering energy, having completed the graduation and masonry, and the laying down of the first track of railway for a distance of about three miles within the District of Columbia to the boundary of the corporate limits of Washington, and likewise for an additional distance of about 1½ miles within those limits to Pennsylvania Avenue, in that city; so that the entire line was opened for travel on the 25th day of August last, on which day the President and Directors opened the road with appropriate ceremonies; four of the locomotives, with their respective trains, having

on this interesting occasion, passed from Baltimore to Washing ton and returned during the day, conveying nearly one thousan persons—the speed being about twenty miles an hour.

In the very short time of a few months, say in less than tw years, the formation of this road, involving the building of upward of 46,000 perches of masonry, and the excavation and removal o nearly 2,000,000 cubic yards of earth, have been effected, and i the same period, a single track of railway upon the entire dis tance (30½ miles) and 5 miles of the second track in the princ pal excavatious, have been laid. I congratulate the Board upo so speedy a completion of the work to the extent describe and at a cost which puts it beyond doubt that when the secon track shall be completed the total amount of expenditure upo the construction of this Railroad will fall short of, th lowest estimate made by me, and which was reported on th 27th July, 1833. Sec. 7th, Ann. Report of President and D rectors, page 59.

Since the opening of the branch road, as above mentione two locomotive engines have been employed upon it in the co veyance of passengers, each making one circular trip daily, an no trip has been lost, or even delayed,beyond a few minutes,

The time consumed in making a trip with the engine. usually from 2 hours 10 minutes, to 2 hours 20 minutes. A though sometimes the journey has been made in 2 hours. Th average time, however, has been about 2 hours 15 minutes, wit a running velocity of about 20 miles an hour, but inclusive o the time spent at the water stations, the average speed is abou 16⅔ miles per hour. This is quite a high velocity, considerin the rawness of the embankments and the consequently liabilit to derangement in the road, as with the utmost care, unequa settlings of the rails will occur, and may have an evil effect be fore a re-adjustment can take place: And this may happen o many parts of the line at the same time, especially on occasion of heavy rains. These reflections would seem to suggest th propriety of a lower rate of speed, until the subsidence of th embankments had rendered the road more permanent, afte which the journey might be made in 2 hours—meantime 1 miles an hour would be more safe, and at this speed the tim would be 2 hours 30 minutes.

It was stated in my last Annual Report, that the graduatio and masonry upon the sixth division of the Baltimore and Ohi Railroad, were then completed, and that in the course of tha season, a single track of railway would probably be laid dow the entire length of this division, extending up the Potomac, and along the margin of the Chesapeake and Ohio Canal, from

ne Point of Rocks to the bridge at Harper's Ferry: This expectation was duly fulfilled, and the road was opened for travel n the 1st day of December last, from which time the trade nd travel have continued to pass upon the Railroad between his city and the point to which the road is finished opposite to Harper's Ferry, without any serious interruption.

The plan of a viaduct to be erected across the Chesapeake nd Ohio Canal and the Potomac river at Harper's Ferry, has een designed chiefly by my late assistant, B. H. Latrobe, the nason work of this structure which is (besides other uses) to orm a connection between the Baltimore and Ohio and the Winchester and Potomac Railroads, has already been contracted or, and it is intended likewise to contract for the superstructure, which is to be of wood, as soon as practicable; in order hat the entire viaduct may be finished in the shortest time possible.

For the details relating to the construction upon both Railoads, I refer to the Report of Caspar W. Wever, superintendent of graduation, masonry and construction.

The surveys and drawings connected with them having been generally completed to Harper's Ferry and to Washington, the services of several of my assistants have been dispensed with; of this number are Benjamin H. Latrobe, who is now chief engineer upon the Baltimore and Port Deposit Railroad, and Henry R. Hazlehurst, and James Murray, who are likewise upon that road as his assistants.

In the department of machinery the constructions have advanced successfully as regards cars and coaches, as well as locomotive engines, in all of which, I am happy to say, our efforts have been crowned with the most brilliant success. For the details in this department of the service I refer to the Superintendent of machinery.

With regard to the locomotive engine, we have to remark that no changes in the principle of its construction, have been introduced and adopted since last year. The working of these American engines proved so satisfactory that it was thought more advisable, inasmuch as the branch to Washington was to be travelled exclusively by the power of steam, to construct without delay, a sufficient number of them to ensure a successful commencement and continuance of the transit between Baltimore and the capitol of the Union, than by attempting to improve so costly a machine, that already worked so well, and by that means risking the chance of a failure in the requisite supply of locomotive engines. Some slight modifications, however, have been usefully made, whilst others, of the decided value of which, time only can test, are in the course of experiment.

In the report of last year, it is stated that the diameter of th working cylinders of the "Arabian" engine were each 12 inche and the stroke 22 inches. All the engines since made, howeve whilst the same length of stroke is preserved, have the diamet of their cylinders increased to 12¼ inches: and this was justifie by the competency of the boiler to generate steam enough work the enlarged cylinders with effect.

It was likewise mentioned in my last Annual Report, that th waste steam, in passing from the cylinders to the fan-wheel wa transmitted in a hollow belt, encircling the boiler, in which be the water pipes leading from the supply pumps were enclose in order that the water in its passage to the boiler might receiv heat from the waste steam. In relation to this mode of savir fuel, or increasing the supply of steam, we have now to sa that in consequence of being attended with two evils, the pla failed to realize the benefits expected from it. In the first plac the reaction of the water immediately before the closing of th valve caused a sudden and powerful strain, upon the long an slender pipe, in which that fluid was enclosed, by which mean the failure of the pipe at the joints, or in some other place, woul often take place: and when this happened the pipe was not eas of repair, by reason of the difficulty of access to it. In th second place the transmission to the water of the caloric of th steam, so far condensed the latter as to render its elasticit unequal to the production of the requisite blast, by means of th fan-wheel. The plan of the belt and its enclosed pipes wa therefore abandoned, whilst the steam was conducted in different manner, and more directly from the cylinders to th fan-wheel: at the same time the engine continued to work re markably well, although, as was supposed, with less economy than if the heat of the waste steam were imparted to the water previously to the injection of the latter into the boiler

To effect the accomplishment of this purpose it was pro posed by Ross Winans, assistant engineer of machinery, t cause the waste steam, after it should have operated upon th blowing apparatus, to pass through 100 copper tubes, each hal an inch in diameter and 15 inches in length, contained and fixe within a cylinder 14 inches in diameter and 15 inches i length; which cylinder is attached to the exterior of the boiler and with the fixtures of the fan-wheel, presents a uniform finish The water on its way from the force pumps to the boiler is im pelled into and through the cylinder amongst the copper tubes, through which the steam is discharged, as above mentioned by which expedient the boiler would be supplied with water already charged with a considerable degree of heat.

The apparatus for heating the water before it is thrown into the boiler, as last described, has been made and attached to one of the engines of the latest construction, but there has not yet been time to measure the utility of the contrivance by the test of experience.

Subsequently to the construction of the "Arabian" engine described in the last report, weighing $7\frac{1}{2}$ tons, an increase of weight to the extent of about one ton appears to have been introduced, so that the engines of the most recent construction weigh about $8\frac{1}{2}$ tons. The augmentation in weight has accrued from an increase of metal in the wheels, and in several other parts, being introduced in order to secure greater permanency and durability in the machine.

The opinion was expressed in my last Annual Report that an engine of $6\frac{1}{2}$ tons would have sufficient adhesiveness for the conveyance of passengers upon the branch road to Washington; and if an engine of this weight could be made of sufficient strength and durability of parts, and having at the same time a capacity to supply steam enough to maintain the desired speed; such should be the class of engines to be employed upon that road. The immediate necessity, however, for fabricating a number of engines sufficient to effect the business that would be required, has prevented an effort to produce a locomotive engine of the desired weight: at the same time we have sanguine hopes that success will attend our labors, in this respect also, whenever the effort can be considerately made.

In relation to the power of the Arabian engine the result of an experiment was given in the Report above mentioned, by which it appeared that this engine, the adhesions of both pairs of wheels being employed, drew after it, exclusive of the tender, upon a level part of the Baltimore and Ohio Railroad 112 tons 18 cwt. 1 qr. gross at a speed of 11.79 miles per hour, and it ascended a grade of 17 feet per mile in a curve of less than 1000 feet radius at the rate of 6 or 7 miles an hour. Engines of such power, as was here displayed, would seem to be capable of doing any kind or amount of business that commerce or intercourse should demand; nevertheless, those subsequently made, whilst they have been somewhat augmented in mass, have come forth with a power of steam and of traction hitherto unequalled, weight for weight, it is believed, in the operations of the locomotive steam engine. One of them drew upon the occasion of opening the branch to Washington, on the 25th of August last, 250 persons in 5 eight-wheeled coaches, being a gross weight of about 47 tons; at a speed of 20 miles an hour, and at

this rate too up the ascents of 20 feet to the mile, of which grade there are on that road 5 or 6 consecutive miles.

The power of one of the new engines of 8½ tons, called the "G eorge Washington," was recently tested upon the Washington branch railway. It drew a train of 30 freight cars and one passenger coach weighing, exclusive of the engine and tender, 113 tons gross. With this load the time in passing over 29 miles of the road towards Washington was 2 h. 44 min. 30 sec. including the time consumed in stopping by the way to replenish with water, &c. amounting to 32 min. 40 sec. And the time employed in returning over the same distance, with the same train, was 2 h. 30 min. 33 sec. including stoppages to the amount of 25 min. 55 sec. In the one direction the average velocity whilst in motion was, therefore, 13.2 and in the other 14 miles per hour. The road at the two ends of the journey is nearly upon the same level, yet the part at Washington is lower by about 20 feet than that at the commencement of the branch at the Patapsco.

The average speed, though great with the enormous load mentioned, does not furnish a just measure of the full power of this engine: on account of the extent of the level and descending parts of the *way*, the speed might have been much greater, but extreme velocity was not the object of the experiment, and the supply of steam in the cylinders was regulated by the engineer so as to approximate to a uniformity of speed upon all parts of the road. It is upon the ascending parts of the railway, therefore, that we are to look for the full display of power on this occasion: and it was observed that the train ascended 5 consecutive miles of the road, having a uniform ascent at the rate of 20 feet to the mile, in 26 min. 8 sec. being a velocity at the raie of 11.48 miles per hour. Here, the weight of the tender being 5½ tons, and the resistance upon a level part of this railway being assumed at 11 lb. per ton, the force of traction required to balance the friction and gravity of the train of 113 tons was 2203 lb. whilst, allowing for the gravitating tendency down the descent; of the engine and tender, it will appear that the engine did, upon this occasion, exert a power of traction, (beyond what was sufficient to overcome the friction upon a level of itself and tender) equal to 2322 lb. at a speed of 11.48 miles per hour; being equal to the conveyance upon a level at this velocity of a train of cars weighing gross 211 tons.

This engine with several others of the same model have been built during the past year, at the Company's work shop, by the contractors Davis and Gartner, which firm is now dissolved in in consequence of the lamented death of Phineas Davis, the effi-

cient partner, who attended personally to the planning and construction of the engines; and to whose genius and worth, the world is indebted for several valuable improvements in railway machinery.

For the operations relating to transportation, I must refer to the report of the officer having charge of that department of the service.

With thy approbation, and at the solicitation of Samuel Sprigg and Joseph Caldwell, Esquires, on behalf of the citizens of Wheeling and its vicinity, and of John Thompson, Esq., residing at the Flats of Grave Creek, on behalf of the interests at that place and its neighborhod, I commenced early in the month of May last, a reconnoissance of the Alleghany mountains, and the country generally, from Cumberland, in Maryland, to the Ohio river at Wheeling, and likewise at the Flats of Grave Creek, in Virginia, with a view to judge of the practicability of obtaining a route for a railroad from the Potomac at Cumberland, to the Ohio river at the points just mentioned.

The examination was likewise carried to the Ohio river, at the city of Pittsburgh.

In the course of this reconnoissance, many difficult defiles in those mountainous regions were penetrated and examined, and connections traced between the gaps, which nature has formed, in the various parallel chains of which the Alleghanies are composed; and access was had to all the authorities that could shed light upon the topography of the country in question, either as to distances or altitudes.

These examinations have resulted in a perfect conviction on my part, of the entire feasability of a railroad from Cumberland to the Ohio river: and moreover, that it is entirely practicable to construct a railroad, within reasonable limits of expense, from Cumberland to Wheeling, and likewise to Pittsburgh, upon which the motive power may be that of steam by locomotive engines, and dispensing entirely with fixed or stationary engines, with their inclined planes, ropes, and other fixtures.

For a more detailed account of the reconnoissance and the results, and of the capabilities of the locomotive engine in traversing different grades at various velocities, reference is made to my report to thee of the 30th ult. upon that subject; which report I hereunto annex, accompanied with a map of the country from Cumberland to the Ohio river, exhibiting the routes examined.

Respectfully submitted,

J. KNIGHT,

Chf. Engr. Balt. and Ohio Railroad.

Baltimore, September 30, 1835.

To Philip E. Thomas, Pres't, &c.

Having recently made a reconnoissance with a view to a Railroad across the Alleghany mountains, from the Potomac River at Cumberland, in Maryland, to the Ohio River at Wheeling, and at the Flats of Grave Creek in Virginia, and also at Pittsburgh in Pennsylvania, I avail myself of the present occasion to report the results, and to offer such views in relation to the scheme as shall seem just and proper.

The construction of the Baltimore and Ohio Railroad, having reached the bank of the Potomac opposite to Harper's Ferry, and its further extension up that river towards Cumberland, being staid by the terms of the compromise between the Railroad and Canal Companies, until such time as the Canal shall be, or by its charter should be, completed to Cumberland; and the liberal grant of the State of Maryland, at the last session of the legislature, being calculated to ensure a speedy completion of the Chesapeake and Ohio Canal to that point, the present was deemed by many to be a proper time to make examinations, with a view to induce the extension of the Railroad from the same point to the Ohio River. The people of Wheeling, in that spirit of enterprise for which they are conspicuous, made the first movement to procure this examination, and having obtained thy approbation and my own consent, I undertook to make the reconnoissance at such time as I could be spared from the railroad service here. In pursuance of this arrangement, I commenced at Cumberland in the month of May last, examining the several routes hereinafter described, and completed the service in the month of August; having during the time visited this city in June, upon the business of my office as Chief Engineer.

Upon reaching Wheeling with the examination, a route was likewise viewed to strike the Ohio river near Elizabethtown, at the flats of Grave Creek. This was done at the request, and upon the representations of the citizens of that place and vicinity. A route was also examined to the city of Pittsburgh, as the grant of the State of Pennsylvania to the Baltimore and Ohio Railroad Company, for right of way, &c. through that state, required that if the main stem of the railroad should not terminate at the Ohio river in the vicinity of Pittsburgh, then the said Company should construct simultaneously, a lateral railroad from the main stem to that city. Such, however, is the importance of the city of Pittsburgh, and its connection with the north and west, as well as with the great Lakes, that an ex-

amination to it, would have been amply justified in the absence of any legislative injunction to that effect.

Accompanying this report is a map of the country comprising such parts of Virginia, Maryland and Pennsylvania, as are necessary to exhibit the relation of the several routes, and connection of the more important places situated upon roads or water courses, or intersected by the several lines examined and marked upon the map. There is likewise represented the route of the Cumberland road to Wheeling, as constructed by the general government, and the route surveyed and recommended for the Chesapeake and Ohio Canal, from Cumberland to Pittsburgh, by the United States' Board of Internal Improvement, and to this map reference is made for a better understanding of what is written in this report.

Instrumental levels and surveys having been executed from Cumberland along the principal ravines and water courses, and through the more noted passes across the mountain chains, also to Wheeling and Pittsburg, in the course of operations connected with the location and construction of the Cumberland road, and of the traces of routes for the contemplated Chesapeake and Ohio Canal—I have availed of the knowledge of heights and distances so ascertained, combined with those estimated in this reconnoissance, to infer the grades that it may be necessary to establish upon any given route with a view to a railroad.

Passing from Cumberland in any direction towards the Ohio River, we meet with a succession of mountains and ridges, nearly parallel to each other, and ranging about northeast and southwest. The difficulties presented to the eye of the traveller in his course upon the common road across the Alleghanies, would seem to forbid the construction across them of any railroad for the purposes of general and reciprocal trade and intercourse, much less one upon which the locomotive steam engine should ply with effect and speed. Pursuing the route of the Cumberland turnpike road, already mentioned, in the direction towards Brownsville and Wheeling, we are almost continually ascending and descending the mountain slopes for a distance of sixty miles, to the western base of Laurel Hill, near Union Town. At the town of Cumberland, beautifully situated upon the left bank of the North Branch of Potomac, at the mouth of Will's Creek, and at the eastern base of Will's mountain, the National Turnpike road commences, and ascends that creek, through a gap in that mountain; thence turning to the left of Braddock's run, it passes through the gap of Dan's mountain, and immediately commences the ascent of the Great Savage, or the Great Backbone mountain, as the same ridge is denominated

where it divides the eastern and western waters southwest of the pass through it of Savage River. The summit of this mountain upon the road, is gained in about thirteen and a half miles from Cumberland; and the top of the Little Savage mountain, a mere spur of the Great Savage, is reached at a mile and a quarter further. Between this spur and the main ridge in what is called here the Cranberry Swamp, situated about two miles northeast of the turnpike road, heads the Savage river, which runs a southwest course about twenty miles to its junction with Crabtree creek, and thence a southeastern course five miles to the Potomac, at about 30 miles by the course of the river, above Cumberland. Descending westward from the Little Savage to Bromley's, now Beall's tavern, the turnpike passes the ridge that here divides the eastern and western waters, or the Savage river and the Fishing branch of Piney run. This dividing ridge is called the Little Backbone mountain, and is here about 1737 feet above the Level of Cumberland, or 2372 feet above the level of the tides of the Chesapeake.

The following table exhibits the principal summits, and some of the depressions traversed by this road, from its commencement at Cumberland, to its termination in Wheeling, at a point about 80 feet above the level of the Ohio river.

Names of places on the Cumberland Road.	Distance in miles.	Total distance from Cumberland.	Height in feet above Cumberland.	Height in feet above Tide.
Cumberland,	00	00	00	635
Frost-town,	11	11	1255	1890
Great Savage mountain, summit,	2½	13½	2022	2657
Savage river, 2 miles from its head,	1	14½	1741	2376
Little Savage mountain, summit,	¼	14¾	1900	2535
Little Backbone mountain, summit (at Beall's) dividing eastern and western waters,	½	15¼	1737	2372
Meadow mountain summit,	5¾	21	2019	2654
Casselman's river,	2½	23½	1443	2077
Negro mountain summit,	5½	29	2191	2826
Keyser's Ridge summit, a spur of Negro mountain,	2	31	2208	2843
Winding Ridge summit,	4	35	1899	2534
Smythfield at Youghiogheny river,	6	41	770	1405
Barren Hill summit,	5	46	1815	2450
Woodcock Hill, or Briery mountain,	3	49	1865	2500
Laurel Hill, or most western mountain,	8½	57½	1777	2412
Munroe, at western base of Laurel Hill,	3	60½	430	1065
Uniontown,	2½	63	317	952
Cauley's Hill,	8	71	639	1274
Brownsville, at Monongahela river,	4	75	198	833
Hillsborough,	12	87	1115	1750
Washington,	12	99	771	1406
West Alexandria,	16	115	1162	1797
Wheeling, at Ohio river,	16	131	113	748

The height of Cumberland above tide is here assumed to be 635 feet, as stated by N. S. Roberts in his Report to the Chesapeake and Ohio Canal Company upon the coal mines and railway routes from the same to Cumbarland, 18th Sept., 1829. The level of a point one mile below Cumberland is stated in the Report of the U. S Board of Internal improvement signed J. Bernard, Brig. Gen., Wm. Tell Poussin, Capt. Top Engrs., Wm. Howard, Civil Engr., Washington city, 23d Oct., 1826, to be 578 feet above tide: and this point is readily conceived to be 57 feet lower than the place in Cumberland selected by N. S. Roberts, as the base of his operations. In James Shriver's map, published in 1824, the level of Cumberland is assumed to be 537 feet above that of tide water, a height that has been corrected by subsequent levellings, and especially in those conducted by

Col. Abert for the United States Board of Internal Improvement. The heights upon the turnpike road, in the preceding table, are partly taken from the profile of Shriver's map, but as the level of Cumberland was not accurate, and as the levels of the several points westward of that town, were deduced from the grades of the road which, although they may be sufficiently accurate for the purpose of such a road, are yet not so exact as levellings taken for a canal or a railroad, not to mention that no correction for the earth's curvature was made; some changes in the heights above tide, have been made from Cumberland to Casselman's river—none however have been made beyond that stream, as the omission to correct for curvature would cause those parts to be represented too high: and they are yet too high, especially beyond the mountains. For instance, Brownsville, upon the river bank, about 50 feet above low water mark, is stated to be 833 feet above tide, whereas it is probably but 730 feet, deduced as follows:

	Feet.
Monongahela river at Pittsburg, according to levels for Chesapeake and Ohio Canal, (supposed at low water,) above tide,	648
Fall in the Monongahela, from Brownsville to Pittsburg, as ascertained at low water, by Dr. Howard,	30
Low water at Brownsville, above tide,	678
Add for height of street on river bank, say	52
Height of Cumberland road at Brownsville, above time,	730

Wheeling is about 650 feet, Pittsburg 700 feet, and Brownsville 730 feet above tide.

It will be seen from what is stated in the table of the heights just given, that the Cumberland road in traversing the several mountains and streams, frequently deviates very greatly from the same level, and sometimes the change is made in very short distances. The more prominent levels only are, however, here given. In addition to these, the number of hills and ravines crossed are very great, insomuch that the far greater proportion of the entire road is either ascending or descending at four or five degrees, the latter being at the rate of 1 in about $11\frac{1}{2}$ or 460 feet per mile. To the view of the traveller upon this road therefore, as has been already remarked, the aspect of the country passed through would seem to deny the possibility of obtaining a graduation suitable for a Railroad of the description contemplated.

When, however, the object is a line suitable for a canal or for a Railroad, the eye of science expands its view and embraces the widest field within the limits of practicability, and it is soon perceived that many of the formidable barriers encountered upon the turnpike road, have been rent assunder in the convulsions of nature, that stampt the great features of this portion of the earth's surface. After a little further investigation, it is found that all the mountain ridges, save one, have been severed, and that the gaps thus formed, afford so many passages for the streams that drain these high and humid regions, and that the rivers rising in, and flowing from, the single unbroken dividing ridge, the one eastward to the Potomac, and by it into the Chesapeake bay, and the other westward to the Monongahela, and by this stream into the Ohio river, are sufficiently direct, in their courses through these mountains, to afford one or more practicable routes for a Canal; should there be found a sufficiency of water for its supply, not only at the highest level where the ridge dividing the eastern and western waters must be pierced by a tunnel, but likewise at all the inferior levels throughout the line. It is seen that the same routes are entirely practicable for a Railroad, even if there should be a lack of water for a canal; and that a shorter tunnel, if any, will be required for the Railroad. Dispensing with the condition of any but a small supply of water, other routes entirely impracticable for a Canal, will be altogether feasible for a Railroad. Hence, with a view to the latter improvement, the field of examination is much wider than for the former.

In point of fact, two routes have been pronounced by the U. S. Board of Internal Improvement, practicable for the Chesapeake and Ohio Canal, from Cumberland, to Turkeyfoot, (the junction of the Youghiogheny river, Casselman's river, and Laurel-hill creek)—the one 88 miles 1040 yards in length, 2837½ feet of lockage, and 1 mile 568 yards in length of tunnel; with a superincumbent ridge 233 feet high; the other 70 miles 1010 yards in length, 1961 feet of lockage, and 4 miles 80 yards in length of tunnel, with a superincumbent mountain 856 feet high above the tunnel level. The summit level of the one comprises a distance of 12 miles 1604⅔ yards, of which 5 miles 832 yards are of deep cutting, (mostly in the glade of Deep Creek) beside the tunnel of 1 mile 568 yards just mentioned, whilst the summit level of the other, (by Will's creek and Flaugherty) is in length 5 miles 1280 yards, of which beside the tunnel of 4 miles 80 yards, there are 1200 yards of deep cutting. In either case the summit level and many miles of Canal, with the numerous locks

upon the same, are to be supplied with water mainly from stupendous reservoirs, to be erected and maintained in the Youghiogheny, or the Casselman's river and their tributaries. From Turkeyfoot the route of the Canal continued upon the right bank of the Youghiogheny river to the Monongahela, and thence to Pittsburgh.

Mention is here made of the routes surveyed and reported for the Chesapeake and Ohio Canal, in order to show their adaptation to a railroad, and in pursuance of that design there are extracted and here given, a few more notes, observations, and statements, from the report of the U. S. Board of Internal Improvement, already mentioned.

The Summit Level by Deep Creek.

The section of Canal from the tunnel at Dewickman's Arm to the mouth of Bear Creek, would follow the valley of Deep Creek as far as the rapids, then turn *Panther point*, and descend to the mouth of Bear creek, along the left (right?) side of the Youghiogheny. However, it became necessary to compare this route with another more direct, which, following the former as far as Deep creek bridge, would continue to Rocklick run, a western tributary of Bear creek. The survey has shown, that the bottom of the Canal being assumed *three feet* above the bottom of Deep creek at the bridge, a tunnel would be necessary to cross the ridge which separates Buffalo Marsh run from Rocklick run. The distance and descent are as follows:

	Miles.	Yards.	
From eastern end of Tunnel at Dewickman's arm to the base-mark at Deep-creek bridge,	6	1048	*Level*
From the base-mark to the debouch into Rocklick run,	5	38½	*Level*
From this debouch to the mouth of Bear creek,	7	535½	
Descent in the latter distance, (adding 13¾ feet,) with a view to shorten the Tunnel, &c.			*Feet* 925
Total =	18	1622	925

In this total distance of 18 m. 1622 yds. two Tunnels would be necessary: one at Dewickman's arm, length . . 1 m. 568 yds.
And passing below the summit of the Little Backbone mountain, ... 233 feet
One tunnel at Buffalo marsh run, whose length to Rocklick run is . . . 2 m. 251 yds.
And passing below summit . . . . 313 feet

Total length of the two Tunnels = 3 m. 822 yds.

Route around Panther Point.

	Miles.	Yards.	Feet.
From eastern end of Tunnel at Dewickman's arm to the base-mark at Deep-creek bridge,	6 ..	1048	
Descent in this distance,			00
From the base-mark to the western end of summit level,	6 ..	$204\frac{2}{3}$	
Descent in this distance,			00
From the western end of the summit level to the mouth of Bear creek, along Youghiogheny river,	15 ..	100	
Descent in this distance,			912
Total =	27 ..	$1352\frac{2}{3}$ ..	912

Upon this portion of the route there would be one Tunnel only, that is, through the Little Backbone mountain, at Dewickman's arm of Deep-creek glade. The projected length of this Tunnel, as already stated, is 1 mile 568 yards.

	Miles.	Yards.
Route around Panther Point, =	27 ..	$1352\frac{2}{3}$
Route by Buffalo Marsh and Rocklick runs =	18 ..	1622
Difference =	8 ..	$1490\frac{2}{3}$

A comparison of the Canal routes from one mile below Cumberland to one-fourth mile below the mouth of Casselman's river.

1. *The Deep Creek Route, and by Panther Point.*

	Miles.	Yards.	Feet.
From Cumberland bench-mark, passing up the Potomac to the mouth of Savage river,	30 ..	350	
Ascent in this distance,			$327\frac{1}{2}$
From mouth of Savage up the same to mouth of Crabtree creek,	5 ..	000	
Ascent in this distance,			383
From mouth of Crabtree creek, up the same to East end of summit level,	8 ..	1430	
Ascent in this distance,			1051
Total ascent, $1761\frac{1}{2}$ feet.			
	44 ..	20 ..	$1761\frac{1}{2}$

Summit Level.

	Miles.	Yards.		
Eastern deep cut,	0 ..	352		
Tunnel,	1 ..	568		
Western deep cut,	5 ..	480	12 ..	$1604\frac{2}{3}$
Western end, west of deep cut,	6 ..	$204\frac{2}{3}$		

	Miles.	Yards.	Feet.
From the western end of the summit level passing down the right bank of the Youghiogheny river, to the mouth of Bear creek,	15 ..	100	
Descent in this distance, . . .			912
From mouth of Bear creek to a point on the Youghiogheny river $\frac{1}{4}$ mile, or 440 yds. below the mouth of Casselman's river,	16 ..	$1075\frac{1}{3}$	
Descent in this distance, . . .			164
Total descent, . . 1076 feet.			
Total distance and lockage, . =	88 ..	1040 ..	$2837\frac{1}{2}$

2. *The Will's Creek Route.*

	Miles.	Yards.	Feet.
From Cumberland bench-mark, passing up Will's Creek to the Eastern end of the summit level, ...	29 ..	240	
Ascent in this distance, - - -			1325
Summit Level. Eastern basin, . .	0 ..	880	
Eastern deep cut, .	0 ..	140	
Tunnel, . . .	4 ..	80	
Western deep cut, .	0 ..	1060	
Western basin at mouth of Flaugherty,	0 ..	880	
	5 ..	1280	
From the western end of the summit level, passing thence down upon the right bank of Casselman's river, to the Youghiogheny, $\frac{1}{4}$ m. below the mouth of Casselman,	35 ..	1250	
Descent in this distance, . . .			636
Total distance and lockage, . =	70 ..	1010 ..	1961
The same by the Deep Creek route, already stated, . . =	88 ..	1040 ..	$2837\frac{1}{2}$
Therefore, the Will's creek route is shorter, and has less lockage than the Deep creek route, by Panther Point, by	18 ..	30 ..	$876\frac{1}{2}$
But the Deep creek route by Buffalo marsh and Rocklick run, is shorter than the same route by Panther Point, by	8 ..	$1490\frac{2}{3}$	
Therefore, the Will's creek route is shorter than the Deep creek route by Buffalo marsh and Rocklick runs, by	9 ..	$299\frac{1}{3}$	

Heights above the level of Cumberland bench-mark, and of tide of certain points upon, and connected with, the route by Deep creek.

	Above Cumb'd bench-mark.	Above tide.
	Feet.	Feet.
Bench-mark, one mile below Cumberland, -	0	578
Mouth of Savage river, at Potomac, - -	327½	905½
Mouth of Crabtree creek, at Savage river, -	710½	1288½
Eastern end of Tunnel at Dewickman's arm, or summit level of Canal at Deep creek bridge, - - - - - - - - -	1761½	2339½
Summit of Little Backbone mountain, 233 feet above the Tunnel at Dewickman's Arm, (and in a low gap,) - - - - -	1994½	2572½
Summit of same mountain at the head of Crabtree creek and Little Youghiogheny,	2012½	2590½
Summit dividing Buffalo marsh and Rocklick runs, 343 feet above Tunnel, - - -	2104½	2682½
Summit dividing Buffalo marsh and Bear creek Glade, at the head of main branch of Bear creek, - - - - - - - - - -	1921½	2499½
Summit between Buffalo marsh and Hoy's runs, at John McHenry's, - - - - - -	1911½	2489½
Summit between Hoy's run and Sang run, near the preceding summit, - - - - -	1911½	2489½
Summit between Sang run and Rocklick run, and, therefore, between Buffalo marsh run and Rocklick run, by way of the depressions at the heads of Hoy's run and Sang run, - - - - - - - - - -	1961½	2539½
Bear creek, at its forks, say 1¾ miles from its mouth, - - - - - - - - - -	980½	1558½
Mouth of Hoy's run at Youghiogheny river, - - - - - - - - - - - -	1361½	1939½
Mouth of Bear creek at Youghiogheny river, - - - - - - - - - - - -	849½	1427½
Youghiogheny river, at Smythfield, on the Cumberland road, - - - - - - -	767½	*1345½
Youghiogheny river, ¼ mile below mouth of Casselman's river, - - - - - - -	685½	1263½

* This is 59½ feet lower than the level of Smythfield, as already given in the table of the heights and distances on the Cumberland road; some 20 or 30 feet of this difference may be owing to the difference of height of the Canal line and the turnpike road, at that place, whilst the residue may arise from the grades of the road giving too high a result.

Railroad from Cumberland to Turkeyfoot by the Deep Creek Route.

From Lt. Trimble's memoirs and surveys of the U. S. Top. Engineers, the following table is deduced:

	Miles.	Ascent. feet.	Ascent. per mile.	Height above Cumberland.
From Cumberland bench-mark, passing up North branch of Potomac to mouth of Savage river,	30	327½	10.9	327½
From thence up Savage river to mouth of Crabtree Creek, -	5.5	378	68.7	705½
Thence up Crabtree Creek to Swan's Saw-mill, - -	7.5	940	125.3	1645½
Thence to summit of the Little Backbone mountain at head of Crabtree Creek and Little Youghiogeny, - - - - -	3.5	367	105	2012½
	46.5 miles, average 43 ft. pr m.			

It would, however, be impracticable to ascend with the line of the railroad more rapidly in the valley or ravine of the Potomac than the natural rise in the valley itself. But the case is different in the ravines of Savage and Crabtree, where the grade may be equalized by occupying the mountain slopes, and even lessened by commencing the higher grade at the mouth of Georges Creek, (two miles below the mouth of Savage,) or by passing along the Potomac a short distance above the mouth of Savage, and returning upon a higher level into the ravine of the Savage river. The distance from the mouth of Savage to the summit of the Little Backbone at the head of Crabtree and Little Youghiogheny, is, by the foregoing table, 16.5 miles, and the ascent 1685 feet, or at the average rate of about 102 feet per mile. Wherefore, by elevating the line 35 feet at the mouth of Savage, there would remain 1650 feet to surmount, at a grade of precisely 100 feet per mile. This uniform grade would place the line upon the mountain side opposite to the mouth of Crabtree Creek, about 200 feet above the level of the stream at that point: and although the slope of the ground appeared from actual inspection to be quite steep, yet it is believed to be practicable to form a road-bed upon it in accordance with the last mentioned grade.

A lower grade, however, might be obtained, as has already been proposed, by commencing the higher ascent at Georges Creek or Westernport, passing up on the left side of Savage river to a suitable point above the mouth of Crabtree,

thence crossing the Savage perhaps near to the mouth of *Dry Run*, returning upon the right side of the river, and curving into the ravine of Crabtree upon the left side of it, extending the grade to the summit at the pass of the Little Backbone mountain. In this manner, with a sacrifice of distance, the grade could probably be reduced to 90 feet per mile, or even less.

The foregoing tabular statement extends to the summit near the residence of Jonathan Wilson, between Crabtree Creek and Little Youghiogheny, a point in the direction towards Cheat river, and about $2\frac{1}{2}$ miles beyond the point where the route by Dewickman's Arm of Deep Creek glade leaves the valley of Crabtree Creek. It is to this latter point, therefore, or rather to the summit of the Little Backbone mountain at half way of the line of the Tunnel as projected for the canal, and distant from the mouth of Savage upon the canal survey $14\frac{67}{100}$ miles, that we must assign the probable grade for a railroad to traverse the route by Deep Creek.

Level of canal tunnel above tide,	=	$2339\frac{1}{2}$
Mouth of Savage above tide,	=	$905\frac{1}{2}$
Canal tunnel above mouth of Savage,	=	1434

From the mouth of Savage to the eastern end of the tunnel, is 14 m. 20 yds., and raising the road at the mouth of Savage 33 feet, the grade to the tunnel, supposing the distance unaltered, would be 100 feet per mile. The projection of this tunnel of 1 m. 568 yds. with an enormous cut in Deep Creek glade of 5 m. 480 yds. in length, were rendered necessary in order to supply the summit level, and contiguous parts of the canal with water: consequently it will not be necessary, neither will it be expedient, to encounter so much expense in the construction of a railroad. Upon a view of the ground, it was believed, that a horizontal line in the proper direction, passing through the mountain 100 feet below the natural summit, would be 440 yards in length under ground; and hence with cuts at the ends of 30 feet in depth a tunnel of a quarter of a mile in length would pass 130 feet below the apex of the mountain, 103 feet higher than the projected canal tunnel, and 1537 feet above the level of the mouth of Savage, distant 14.67 miles by route of canal survey; supposing as before, the road to be elevated 33 feet at the mouth of Savage, it would require a distance of 15.04 miles to surmount the given height at a grade of 100 feet per mile, and involving a loss of distance upon the canal route of, say, half a mile. But if the grade should be *one degree*, or 92 feet per mile, the requisite distance whould be 16.35 miles, or about $1\frac{3}{4}$ miles longer than the canal line between the same points. Here the choice would lie between a grade of 100 feet per mile, and

one of 92 feet upon a route elongated 1¼ miles. Should we reject the plan of a tunnel, and make an open cut through the mountain of, say, 1000 feet in length, and 72½ in extreme depth, the railroad summit would then be 2500 feet above tide, the same as that between Buffalo Marsh and Bear Creek (2499½ feet) as herein before stated. In this alternative, the summit would be 1594½ feet above the mouth of Savage, or 1561½ feet above the road when raised 33 feet; and the distance required to gain this height at the rate of 100 feet per mile, would be 15.61 miles, being a loss upon the canal line of one mile, whilst at a grade of 92 feet per mile the, distance must be 16.97 miles, at a loss of, say, 2¼ miles. The open cut of 1000 feet long would, therefore, require half a mile more of distance upon the eastern side of the summit, than would the tunnel of 1320 feet long.

It may be remarked in this place, that it may be practicable to cross this mountain with a Railroad, at Hinch's Springs, and likewise at the pass between Wetsall's Spring and Savage Lick, either of which would connect the ravine of a branch of Crabtree Creek, with the north fork of Deep Creek. Some advantages might perhaps, be gained by choosing one of these passes, although the height to be overcome might not be reduced.

Having described the probable uniform grade practicable to be obtained up Savage and Crabtree, to the summit at the Little Backbone mountain, it remains to treat of the route westward of that point: and whether the Railroad shall pass by the route surveyed for the canal around Panther Point, and down upon the right side of the Youghiogheny, or whether it shall be made to ascend the valley of Buffalo Marsh Run, at the seat of John McHenry, Esq. and thence pass into a ravine of Bear Creek, in either case the route may be the same to the Bench-mark, at Deep Creek bridge, 5 miles, 1644 yards, from the aforesaid mountain summit—Then, supposing the Railroad level at the bridge to be assumed 35 feet higher than that of the intended canal, the height of the Railroad will there be 2374½ feet above tide; and the mountain summit, in case of the tunnel 2442½ feet, and in case of the open cut 2500 feet, above tide. Consequently in the one case the descent down the glade to Deep Creek bridge, will be 68 feet, or 11.46 feet per mile, and in the other 125½ feet, or 21.15 feet per mile. In the latter case it will not be expedient to make the grade uniform, by reason of lateral depressions or arms in the glade, and it is probable that of the 5 miles 1644 yards = 5·934 miles, 2 miles next to the mountain must descend at the rate of 50 feet per mile, and the remaining 3.934 miles at the rate of 6½ feet per mile to the bridge at Deep Creek.

Route around Panther Point.

The length of the line surveyed for the canal around Panther Point from Deep Creek bridge to the mouth of Bear Creek, is 21 miles 304⅔ yards, and a descent of 912 feet; whilst the descent of the Railroad will be 947 feet, and owing to the rapid descent and curve to and across Hoy's Run, the route of the Railroad must be increased at least a mile to obtain a proper grade; and the distance by Railroad will probably be 22.173 miles, of which 5 miles will descend 460 ft, at a grade of 92 feet per mile, and the remaining 17.173 miles to the mouth of Bear creek, will descend 487 feet, probable at a uniform grade of 28.36 feet per mile.

Route by Buffalo Marsh and Bear Creek.

From Deep Creek bridge at 2374½ feet above tide, the Railroad will ascend the left side of Buffalo Marsh Run, at a uniform grade to the summit pass to the Bear Creek glade 2499½ feet above tide. The distance is 3 miles and the ascent 125 feet, or 41.67 feet per mile. Here the descent into and down Bear Creek, will probably be as follows, viz:

miles.		*feet.*		*feet.*		*feet.*	
½	descend	25	or per mile	50.	Total	25	To Bear Creek Glade.
2	"	60	"	30	"	85	To lower end of Glade then down left side of creek.
1¼	"	38	"	30	"	123	To Yawling's place.
1¼	"	37	"	30	"	160	Passing through narrows and swampy ground.
3	"	180	"	60	"	340	To Philip Harner's mill.
2	"	136	"	68	"	476	Then cross to right side of Bear Creek.
2	"	136	"	68	"	612	To mouth of Hinkle's Glade Run.
5	"	460	"	92	"	1072	To mouth of Bear Creek.

Total 17 miles, or 20 miles from Deep Creek bridge

With the exception of the total descent to the mouth of Bear Creek, the foregoing levels as well as the distances along Buffalo Marsh Run and Bear Creek, are the results of estimation from personal reconnoissance. Excepting a single ravine of some formidableness, the route along the gentle slopes presented upon the left side of Buffalo Marsh Run, and by the delightful and well chosen residence of John McHenry, Esq. is highly favorable for the formation of a road: and the surface of the ground continues remarkably so across the gently rounding summit, through the glade, and down Bear creek, to the lower end of

the swampy narrows, a distance of 5 miles from the summit and 8 miles from Deep creek. Here the ravine of Bear creek begins to descend more rapidly, and at the same time assumes a more rugged and wild aspect, and the more so in its passage through winding ridge, below the confluence of Hinkle's Glade Run: In this distance of 12 miles, there is, with the solitary exception of Harner's, no mark of human industry short of the —— Furnace, near the mouth of the creek, and the formation which is alternately of clay and loose sandstone rock, or both combined, is clothed with dense forests of oak, birch, spruce, &c. and with thickets of laurel, hard to penetrate, and hiding from the view the swiftly speeding waters whose perpetual roarings upon the ear announce the rapid and incessant fall along their rocky course. At the same time, with the exception of a narrow but high projecting limestone cliff into a sudden bend of the creek, about 3 miles from the mouth of it, there is no very serious impediment to a cheap graduation; whilst the limestone furnished from the excavation at the cliff, may more than compensate the cost at that point.

Of the levels, it should be remarked as possible, that the grade of 68 feet per mile for 4 miles below Harner's, may be impracticable inasmuch as the stream there may not descend enough to admit of so steep a grade: If so, and the grade should be reduced to some 55 feet to the mile, raising 52 feet at the end of the 4 miles, it will be entirely practicable to lessen the grade below, by turning the hill near the Furnace at a high level and reaching the level of the bottom lands, upon the river bank some two miles below the mouth of Bear creek. In this way the descent would consist of the aforesaid 52 feet, 460 feet in Bear creek, and 20 feet in the Youghiogheny; in all, 532 feet; whilst the distance would be 5 miles down the creek, and 2 miles down the river, being 7 miles, at a uniform grade of 76 feet per mile.

Upon the whole, the route by Bear creek, although it has an additional summit of 125 feet, yet being about 2 miles shorter, and in all probability much cheaper of construction, is preferred to the route around Panther Point.

It remains to speak of the route by Rock Lick Run, a western branch of Bear creek.

The survey for the canal by this route, with a summit level, elevated at Deep creek bridge 2353¼ feet above the level of tide, gave as follows, viz:

	Miles.	Yards.	
From the base-mark at Deep creek bridge, to the bebouch in Rocklick run,	5	38½	*Level.*
From this debouch to the mouth of Bear creek,	7	535½	
			feet.
Descent in the latter distance,			925¾
Distance and lockage by Rock-lick route,	= 12	574	925¾
Do. by Panther Point route,	= 21	304⅔	912
Difference =	8	1490⅔	13¾

The difference of Lockage would be double of the difference here shown, or 27½ feet against the Rocklick route, which is the shortest by 8 miles 1490⅔ yards. Nevertheless, this shorter route was rejected on account of the long and expensive tunnel required between Buffalo Marsh Run and Rocklick Run, the additional lockage, the increased difficulty of procuring a supply of water, and the double set of Locks required by the rapidity of the descent through a part of the distance.

To locate a Railroad upon the foregoing route, it would pass a summit between Buffalo Marsh and Rocklick Runs, 2682½ feet above tide, and where, from the breadth of the ridge, it would not be expedient to Tunnel or even to cut to a depth beyond a very few feet. However, the road might be laid through the depression at John McHenry's, between Buffalo Marsh and Hoy's Runs, 2489½ feet above tide, and thence by William Hoy's through the gap between Hoy's Run and Sang Run, likewise 2489½ feet above tide, and thence to the depression between Sang Run and Rocklick, where the ridge is 2539½ feet above tide; but being narrow, presents a favorable place for an excavation of 40 feet in depth, that would reduce the summit to 2499½ feet above tide, being precisely the same as that upon the Bear creek route, already discussed. To this point the route would be, from Deep creek bridge, by the valley of Buffalo Marsh to the pass to Hoy's Run, 3 miles, ascent 115 feet, at the rate of 38⅓ feet per mile; thence 3 miles, ascent 10 feet, or 3⅓ feet per mile: total 6 miles. The route of the Railroad would here commence a rapid descent to the mouth of Bear creek, distant by the stream, about 7½ miles, with a descent of 1072 feet; average 143 feet per mile. To reduce the descent to 92 feet per mile would require a distance of about 11¾ miles; and could this be effected by a circuitous and expedient course, which is doubtful, the entire length of this route would be 17¾ miles; and shorter than the route of Bear creek glade, by 2½

miles. The cost of construction upon the shorter route, would probably much exceed that upon Bear creek, whilst the difference in the steepness of the grade would be much more favorable to the efficiency of the motive power upon the latter. Of the several routes by Deep creek and Youghiogheny, therefore, that by the glade and ravine of Bear creek will, at present, be preferred.

From the mouth of Bear creek the route will descend the Youghiogheny river, partly on the right and partly on the left side, crossing it once, to a point on the left side, one fourth of a mile below the mouth of the Casselman's river, or Turkey-foot. The distance according to the survey for the canal is 16 miles 1075⅓ yards = 16.611 miles, and the descent 164 feet, or say 10 feet per mile.

Route from Cumberland to the mouth of Savage river.

The surveys for the canal from the bench-mark one mile below Cumberland, passing up on the north or left side of the Potomac river to the mouth of Savage, give a length of 30 miles, 350 yds.=30.2 miles, and an ascent of 327½ feet. To this ascent must now be added 33 feet, the height already proposed for the railroad at the mouth of Savage, and the altitude to be overcome is 360½ feet, or 11.9 feet per mile upon an average.

To maintain this average grade the work of construction would be very expensive, involving several deep cuts through necks of land, besides much of excavation along cliffs of sand-stone and of lime-stone, alternately washed by the river; and perhaps, (as Lt. Trimble suggested) four viaducts across the river, to avoid the difficult cliffs at Fort-hill.

Upon a view of the ground, it seemed quite practicable to avoid some of the difficulties, and especially those at Fort-hill, by passing up on the north side of the hills through the existing ravines. An elevation, however, of 300 to 400 feet must be surmounted in this alternative, which renders the expediency of the measure very dubious. It would require a closer comparison than can result from a mere reconnoissance to justify a definite conclusion as to the difficulties to be avoided either by viaducts, or by encountering steep grades around hills.

1. Synopsis of the Route for a Railroad from one mile below Cumberland to $\frac{1}{4}$ of a mile below the mouth of Casselmans river—by way of Deep Creek, and avoiding a tunnel.

Distance miles.		Per mile feet.	Total of grade in feet.	Distance fm. Cumberland in miles.	Height above tide feet.	
30.2	ascent	11.9	360½	30.2	938½	mouth of Savage.
17.	ascent	92.	1561½	47.2	2500	sum. of mountain.
2.	descent	50.	100	49.2	2400	Green glades.
3.9	do	6.5	25½	53.1	2374½	Deep Cr. bridge
3.	ascent	41·67	125	56.1	2499½	sum. bet. Buff. m. & Bear Cr.
0.5	descent	50.	25	56.6	2474½	Bear Cr. glade.
4.5	do	30.	135	61.1	2339½	low. end Nar'ws.
3.	do	60.	180	64.1	2159½	Harner's mill.
4.	do	68.	272	68.1	1887½	Hinkle's gl. run.
5.	do	92.	460	73.1	1427½	mo. of Bear Cr.
16.6	do	10.	164	89.7	1263½	to ¼ mile below mouth of Casselmans.

Highest summit 2500 ft. above tide, or 1922 ft. above Cumberland. Summits added=2047 feet overcome westward.

The Wills' Creek Route.

From the eastern end of the tunnel to 1 mile below Cumberland, (at the bench-mark,) the route of the Chesapeake and Ohio Canal, has the following distances and levels. *Summit level,* deep cut 140 yards, basin 880 yards. Thence:

Distance in yds.	Total m.	Total yds.	Descent in ft.	Total descent ft.	
660	0	1540	56	56	
3630	2	1650	120	176	
550	3	340	16	192	
330	3	670	8	200	
770	3	1440	24	224	The canal is on the left bank of the stream (Wills Creek) the first 8½ miles below the summit level.
550	4	230	24	248	
4950	6	1660	136	384	
330	7	230	8	392	
1870	8	340	64	456	
80	8	420	0	456	
1320	8	1740	48	504	Then 2 m. on the right bank, passing mouth Brush Creek on left.
440	9	420	16	520	
1760	10	420	64	584	
920	10	1340	40	624	
1760	11	1340	72	696	Then on left bank to 14th mile after which on the right bank to mouth of Little Wills Creek.
1100	12	680	56	752	
660	12	1340	32	784	
1760	13	1340	88	872	
3520	15	1340	144	1016	

This is at the mouth of Little Wills Creek. Thence down main Wills Creek as follows:

Distance in yds.	Total m.	Total yds.	Descent in feet.	Total descent ft.	
1860	1	100	48	1064	
1220	1	1320	16	1080	
220	1	1540	8	1088	
1200	2	980	32	1120	
2740	4	200	48	1168	
3740	6	420	40	1208	
300	6	720	8	1216	
6960	10	640	56	1272	
1320	11	200	16	1288	
1980	12	420	16	1304	
2880	13	1540	21	1325	To 1 mile below Cum.

$10\frac{1}{2}$ m. of this the canal is on the right bank. Then it crosses to left bk. At 11 miles commences the defile of Wills mountain. At 12 miles it is through the mountain.

	Miles.	Yards.
Distance from eastern end of summit level, to the mouth of Little Wills Creek,	15	460
Thence to the bench-mark, 1 mile below Cumberland,	13	1540
Total=	29	240

		Feet.
At 1 mile below Cumberland, the height above tide is,		578
The summit level of the Wills Creek route or tunnel line of 4 miles 80 yards, is above the point 1 mile below Cumberland,		1325
The summit level is above tide,	=	1903
Height of the mountain directly over the tunnel line,		856
Summit of mountain above tide,	=	2759

The length of the tunnel is 4 miles 80 yards, and of the summit level, inclusive of the tunnel, 5 m. 1280 yds.

Then down all the way upon the right side of Casselmans river, as follows:

From western end of summit level near Myer's mill and mouth of Flaugherty creek, to the mouth of Middle-fork creek, distance $16\frac{1}{2}$ miles—descent 216 feet.—Above tide 1687 feet.

Thence to $\frac{1}{4}$ mile below mouth of Casselmans river, distance 19 m. 1030 yds.—descent 420 feet.—Above tide 1267 feet.

Total distance from the summit level 35 m. 1250 yds,—and descent 636 feet.

	Feet.
The mouth of little Wills creek at $15\frac{3}{4}$ miles from the tunnel is above tide,	887
The same point is above Cumberland,	309
The mouth of Brush Creek at its junction with Wills Creek, at $9\frac{1}{4}$ miles from the tunnel, or $8\frac{3}{4}$ m. from summit level, is above tide.	1383
And above Cumberland,	805

Railroad from Cumberland to Turkeyfoot, by the Will's Creek Route.

We shall avail of the foregoing survey made by Capt. W. G. McNeill, and adopted by the U. S. Board of Internal Improvement, as the route of the proposed Chesapeake and Ohio Canal, as well as of such information as my own examinations have furnished. Inasmuch as the projection of the unusually expensive tunnel upon this route, was made in order to render practicable a supply of water for the higher levels of the Canal, therefore this costly work may be wholly dispensed with, or at least very greatly lessened, in the construction of a railroad.

Flaugherty creek, a western water, heads at the Savage mountain, near the head of Laurel run, a branch of Will's creek, and Cranberry Swamp, the head of Savage river. The two latter streams each cut a longitudinal groove in the Savage mountain, separating it from the Little Backbone mountain, which is for many miles the dividing ridge of the eastern and western waters. The Little Savage is a short but high spur, encircling the north and west sides of the aforesaid swamp, running a southwestern course across the Cumberland road, and terminating at Vaughan's saw mill, about a mile from that road. The Flaugherty, after a course of eight or ten miles from its head, passes through a gap of Meadow mountain, here denominated the Alleghany mountain, because, northeastward from this gap, it divides the eastern and western waters; that is, the waters of Will's creek from those of Casselman's river, and of Stoney creek of the Conemaugh. Eastward from the gap last mentioned and occupied by the stream of Flaugherty, the Will's creek flows through a gap in the Savage mountain. These two mountains lie parallel to each other, and to the general mountain range of N. E. and S. W., whilst the Little Backbone mountain that connects them, and separates the eastern and western wa-

ters, has here a course nearly N. W. and S. E. And it is in this mountain, of noted irregular profile, of alternate knobs and depressions, that we find the lowest natural summit passes. One of these depressions, and the lowest of all except the one at Beall's, on the Cumberland road, of about equal altitude, is found at Albright's farm, at the bend of the mountain between Flaugherty and Wilhelm's saw will, on Laurel run. But more of these hereafter. Another, and the next lowest place lies about one and a quarter miles south from the Canal tunnel line, and three-fourths of a mile south of Absalom Baer's house, and is, by estimation, 350 feet lower than the mountain summit directly over the Canal tunnel line, and therefore 506 feet higher than the level of that tunnel, being 2409 feet above tide, or 1831 feet above the bench-mark one mile below Cumberland. Here the railroad may be made to pass without a tunnel, with a cut of say 50 feet in extreme depth, and of moderate length. The summit upon the line of the railroad, would then be 2359 feet above tide, or 1781 feet above Cumberland.

From the summit, it is believed, the descent eastward must be at the rate of 92 feet per mile for about seven miles, to the vicinity of the mouth of Laurel run, where the railroad line will be some 50 or 60 feet above the level of the Canal line, thus permitting the road to cross that run with a bridge of moderate height. This grade will likewise allow the line to cross the scaffold run with the least height and curvature, at the same time, an expensive viaduct across this deep ravine will be indispensable. Thence the line will have a grade nearly corresponding with that of the stream, but so as to be above the line of the Canal where the latter work has been projected upon the right bank, viz: 4 miles, descending 65½ feet per mile, to the falls near the mouth of Brush creek, and 7 miles at a descent of 75 feet per mile, to a point near the mouth of Little Will's creek; and thence 14 miles, descending at 25 feet per mile, to the bench-mark one mile below Cumberland.

Westward from the summit, the line of the railroad will descend 456 feet at the rate of 91.2 feet per mile for 5 miles to the western end of the projected summit level of the Canal at the Casselman's river and mouth of Flaugherty creek, and where the level of the road will correspond with that summit level, or be 1903 feet above tide, or 1325 feet above Cumberland. Of these 5 miles of road, two will pass down a ravine tributary to Flaugherty creek, and three will traverse the latter stream in its passage through the Alleghany mountain. It may be that a uniform grade here may be impracticable, and that the approach to the mountain gap must be at a less grade than 91

feet per mile. In this event, the termination of the grade of 91.2 feet per mile will be carried a little further down the Casselman: and it may even be practicable to reduce this descending grade so as not in any part to exceed 70 feet per mile.

Having arrived at Casselman's river, the line will immediately cross it, and descend the left bank to the Youghiogheny river, and across this stream to its left bank, and down the same to $\frac{1}{4}$ mile below the mouth of Casselman's river, as follows: 16.125 miles, descent 216, or 13.4 feet per mile, to a point opposite the mouth of Middle fork creek; and thence 19.585 miles, descent 420 feet, or 21.445 feet per mile, to the point of intersection with the Deep creek route, $\frac{1}{4}$ mile below the mouth of Casselman's river, or Turkeyfoot.

2. Synopsis of the route for a Railroad from 1 mile below Cumberland, to $\frac{1}{4}$ mile below the mouth of Casselman's river—by way of Will's creek and Bowman's mill, and avoiding a tunnel.

Distance, miles.		per mile. feet.	Total of Grade. feet.	Dist. fr. Cumb'd in miles.	Height ab. Tide. feet.	
14	ascent	25	350	14	928	mouth of Little Will's creek.
7	ascent	75	525	21	1453	mouth of Brush creek.
4	ascent	65.5	262	25	1715	mouth of Laurel run.
7	ascent	92	644	32	2359	Passing Bowman's mill to summit of mountain.
5	desct.	91.2	456	37	1903	Casselman's river at mouth of Flaugherty.
16.125	desct.	13.4	216	53.125	1687	mouth of Middle fork creek.
19.585	desct.	21.445	420	72.71	1267	To $\frac{1}{4}$ mile below mouth of Casselman's river.

Highest summit 2359 feet above tide, or ascent from Cumberland westward = 1781 feet.

This route is, therefore, shorter than the Deep creek route, by 17 miles.

It has a less distance exceeding a grade of 25 feet per mile, than the Deep creek route, by 16 miles, and a less distance exceeding 50 feet per mile, by 6 miles, and a less distance at a grade of 90 feet and more, by 10 miles.

The Deep creek route has summits amounting to 2047 feet above Cumberland; therefore, the route by Will's creek, has less height of summit by 266 feet.

Of the routes by Braddock's run and Jennings' run, branches of Wills creek, and by Flaugherty creek.

The following notes illustrative of the distances, levels and grades of the country upon the waters of Braddock's and Jennings' runs are extracted from a printed report [furnished by Joseph Shriver, Esq.,] of N. S. Roberts upon the coal mines and

railway routes from the same to Cumberland, made to the Chesapeake and Ohio Canal Company, 18th Sept. 1829. From the report it appears, that the first coal mine examined is situated 8 miles 13 chains (4 pole chains) west of Cumberland, and adjoining the south side of the National road, and is known as Eckhart's mine. This is the thick vein, and it is distinguished both for the quantity and quality of its bituminous coal.

This mine is situated above the tides at Georgetown 1792 feet, and above Cumberland 1157 feet. [Cumberland being taken by N. S. Roberts at 635 feet above tide.]

From Eckhart's mine a level was carried northwardly, and in about one mile the levels of five different mines were taken, and were all found below the level of the place of beginning, although of the same thick vein. "The lowest was Mr. Hoy's old mine, opened in a valley, and from which issues one of the branches of Braddock's run: This mine, the lowest in the vicinity, was found to be 40 feet lower than Eckhart's. These two are about a half a mile apart: Then crossing the valley, and proceeding northerly about 15 chains, we found Ward & Hoy's new mine to be 35 feet higher than the old mine in the valley, and only 5 feet below the level of Eckhart's mine at the National road." The foregoing mines are all of them situated on the head branches of Braddock's run.

A line of levels was now carried from Ward & Hoy's new mine aforesaid, 2 miles 5 chains over the dividing ridge (which abounds with coal) rising 172 feet above the level of the mine. This line was continued down to Frost & Neff's coal mine situated about one fourth of a mile north of Frostburgh, and in the upper end of the valley of Jennings' run. This mine was found 60 feet lower than Ward & Hoy's new mine, 25 feet lower than Hoy's old mine, and 65 feet lower than Eckhart's mine.

	Feet.
Eckhart's mine is above Cumberland, . .	1157
Descent to Frost and Neff's mine, . . .	65
	1092
Frost and Neff's mine, $\frac{1}{4}$ mile north of Frostburgh, on head of Jennings' run, is above Cumberland, .	635
And above tide, . . .	1727

Railroad route down Braddock's run (for the first $5\frac{1}{2}$ miles on the north side of the stream, then on the south side,) from Ward and Hoy's mine 1152 feet above Cumberland, to bank of Wills creek, just below mouth of Braddock's run, and at a point 1103 feet below the level of the mine, and 49 feet above that of Cum-

berland. Beginning 264 feet east from Ward and Hoy's mine, thence:—

Distance in feet.	Angle of descent.		Descent per mile in feet.	Actual descent in feet.	Total descent in ft.
2970	2°	23½′	221	124.2	124.2
2310	2	31	232	101.5	225.7
5280	2	00	184	184.0	409.7
2640	2	13	204	102.0	511.7
5280	1	37¾	150	150.0	661.7
5280	1	28½	136	136.0	797.7
5280	1	13	112	112.0	909.7
2640	1	23¼	128	64.0	973.7
2640	1	00	92	46.0	1019.7
2640	0	39	60	30.0	1049.7
2046	0	41¾	64	24.8	1074.5
1320	1	15	115	28.8	1103.3

40,326 feet = 7 miles 3366 feet.

Average grade 144½ feet per mile, or 1 in 36½ nearly.

Location of a Railroad route by N. S. Roberts, from Frost and Neff's mine, at the head of a branch of Jennings' run, ¼ mile north of Frostburgh, and 1092 feet above the level of Cumberland (that is, 1727 feet above tide.) Length of Railroad line, 9 miles 187 feet, descent 1020 feet, to a point near the mouth of Jennings' run, Willis creek 1½ miles above the mouth of Braddock's run. This line lies wholly on the north side of Jennings' run, excepting at the 8th mile, where two crossings of the stream occur to avoid expense, &c. as follows, viz:

Distance in feet.	Angle of descent.		Descent per mile in feet.	Actual descent in feet	Total descent in ft.
2640	2°	5′	192	96.	96.
2640	0	52	80	40.	136.
2640	1	28½	136	68.	204.
3960	1	5	100	75.	279.
1320	1	59	184	46.	325.
2640	1	49¼	168	84.	409.
2640	1	31	140	70.	479.
2640	1	18	120	60.	539.
5280	1	7¾	104	104.	643.
5280	1	18¼	120	120.	763.
2640	1	00	92	46.	809.
5280	0	57¼	88	88.	897.
5742	0	41¾	64	69.6	966.6
2365	1	18¼	120	53.7	1020.3

17,707 feet = 9 miles 187 feet. *Average* 113 feet per mile, or 1 in 46¾. So far N. S. Roberts.

David Shriver, Esq. who was superintendent for the United States, for the construction of the Cumberland road, states, from his notes, that the height of the national road, at the depression caused by the westernmost drain of the eastern waters (of Savage river) at Bromley's, about the level of the commencement of the road upon the right bank of Wills creek, at Cumberland, is 1670 feet. And that this is likewise the height of the road one fourth of a mile westward from the same point at a western water, (Fishing run) where there is a culvert of 4 feet span. The summit between these points, however, upon the same road, and which divides the eastern and western waters, is 1737 feet above Cumberland.

Upon the same road the summit height of the Great and Little Savage mountains are respectively 2022 feet and 1900 feet above Cumberland. So far D. Shriver, Esq.

Assuming now, what must be very nearly exact, that the level of the commencement of the national road at Cumberland, is the same as that of the point at the same town, given by N. S. Roberts, Esq. viz. 635 feet above tide, and we have, as already stated in the table of heights upon the Cumberland road, viz:

	Feet.
Height above tide of the summit at Bromley's or Beall's, on the Cumberland road, and which divides the eastern and western waters,	2372
Height above tide of Great Savage mountain upon the same road,	2657
Height above tide of Little Savage mountain upon the same road,	2535

We shall here describe the shortest route which it is believed can possibly be obtained within any reasonable limits of expense and without exceeding a grade of 92 feet to the mile. This route will ascend Wills creek, and the ravine and slopes of Jennings'run, to a point from whence the Savage mountain, can be perforated by means of a tunnel, in length about half a mile, passing some 300 feet below the mountain crest, and terminating upon the right side of Laurel run, about 30 feet above the level of the stream. Thence the line will cross the run and pass by a gentle curve, a high and abrupt point of hill, terminating here upon the left, and within a short distance of Wilhelm's Saw mill, situated upon Laurel run, at the junction of a very small stream entering from the westward. The route will then pass up the ravine of the latter stream about three fourths of a mile to the summit of the ridge which divides the eastern and western waters, at Albright's farm. It is estimated that the height of the ridge in this low gap is about 50 feet lower than the same ridge near Baer's, at the crossing of the route by Wills creek

and Bowman's, previously described. The height of the natural summit at Albright's, is therefore assumed at 2359 feet above tide, or 1781 feet above the bench-mark, 1 mile below Cumberland: and as the ridge is here very narrow, it may be proper to reduce the summit by excavation, 50 feet: The extreme height will then be 2309 feet above tide, or 1731 feet above the point, 1 mile below Cumberland.

Laurel run is about $\frac{3}{4}$ mile east of this summit and 1681 ft. above the level of the Cumberland bench-mark; and therefore 50 feet below the summit height now assumed for the Railroad. Flaugherty creek which is here distant only about 100 yards is likewise only 50 feet below the level of the same summit. It is a remarkable circumstance that two streams, each large enough to turn a mill, the one an eastern and the other a western water, should exist within a mile of each other upon the same level, viz: 2259 feet above tide, having a ridge between them of only 100 feet in height, that is, 2359 feet above tide. Such however appears to be the fact at Albright's gap, a pass that can only be gained by a tunnel through the higher part of Savage mountain, unless it be by the circuitous route of Wills creek and the ravine of Laurel run, an alternative that would not offer so short a line as the route crossing the Scaffold run and the ridge near Baer's as already described, though it may afford one of a less grade, as will be shown hereafter.

From the summit of Albright's reduced to 1731 feet above Cumberland the line will take a direct course down Flaugherty creek 5 miles to the commencement of the Alleghany mountain pass, descending in this distance 100 feet at 20 feet to the mile. Thence the route might descend through the Narrows, and to a point about a mile below the mouth of Flaugherty at a grade of 92 feet to the mile: but a grade of 20 feet has been introduced in the valley of Flaugherty, it would be better to assume a more moderate grade than 92 feet in the descent to Casselmans river. It is believed that the ground will admit of a grade of 50 feet per mile, which in a distance of 7 miles, or 4 miles below the western terminus of the summit level as projected for the canal, will reach the canal level at a point a little distance below the mouth of Bluelick run; or the line might, and perhaps should, cross the Casselmans river to its left bank, just above the confluence of the Bluelick, but below that of the Elklick. Thence to the point opposite the mouth of Middlefork creek, 12.125 miles, descending 172 feet, at an average grade of 14.18 feet per mile, and thence to Turkeyfoot as in the route already described.

Assuming 3 miles next to Cumberland at a grade of 51 feet per mile, and half a mile through the tunnel, with a mile elsewhere, at 40 feet per mile, there will remain an altitude of 1518 feet to be overcome at the maximum grade of 92 feet per mile in 16½ miles of distance. It is not doubted but that the conformation of the surface of the ground, upon the mountain slopes; and along the vales and ravines of Jenning's run and of Wills creek, will admit of this system of graduation, from the Cumberland bench-mark, to the summit of the dividing mountain at Albright's.

3. Synopsis of a route for the Railroad from 1 mile below Cumberland, to ¼ mile below the mouth of Casselmans river,—by Wills creek, Jennings' run, Wilhelm's saw mill on Laurel run, Albright's gap, and Flaugherty creek—with a tunnel of half a mile at Savage mountain.

Distance in miles.	Per mile in feet.	Total of grade in feet.	Dist. from Cumberland in miles.	Height above tide in feet.	
3. ascent	51	153	3	731	across Braddocks run.
8. ascent	92	736	11	1467	in val. Jennings' run at supp'd water sta.
0.5 ascent	40	20	11.5	1487	Passing water station.
8.5 ascent	92	782	20	2269	east. of tunnel and at Savage moun.
0.5 ascent	40	20	20.5	2289	west. of tunnel and at Laurel run.
0.5 ascent	40	20	21	2309	summit of dividing moun. at Albright's
5. descent	20	100	26	2209	down Flaugherty to Alleghany moun.
3. descent	50	150	29	2059	to op. W. end sum. level of canal line.
4. descent	50	200	33	1859	cross. Casselman's river to left side.
12.125 do 14.18		172	45.125	1687	mo. Middlef'k creek.
19.585 do 21.445		420	64.71	1267	to ¼ m. below the mo. of Casselman's river, or Turkeyf't.

Highest summit passed 2309 ft. above tide, or 1731 above Cum.

This route is therefore 25 *miles* shorter than the Deep creek route, and it has less height of summits to overcome by 316 feet; and does not reach so high an altitude by 191 feet. It has an ascent westward at 92 feet per mile for 16½ miles, but no such high grade eastward, whilst the Deep creek route has 17 miles of equal grade westward, and 5 miles of such grade eastward. This route has a less distance than the Deep creek route at a

grade exceeding 25 feet per mile, by 11 miles, and less distance exceeding 50 feet per mile, by 9½ miles

The route by Albright's *with the tunnel* is likewise shorter than that by Will's creek and Bowman's mill, *without a tunnel*, by 8 *miles ;* and has a lower summit by 50 feet—whilst the grades are rather easier upon the longer route, although the extreme grade is the same upon each.

As already noticed, it is thought impossible, without increasing grade, or expense, beyond proper limits, to obtain a shorter route for a Railroad than that last described, by Albright's. The route might, indeed, be shortened, by passing from the summit at Albright's across the valley of Flaugherty and the dividing grounds in the ravine of Piney run, and down the same to Casselman's river; thence up the same to Salsbury, and thence a short distance to the mouth of a tributary from the westward, ascending which, a tunnel must be driven through Negro mountain to a drain of Negro Glade run, or otherwise of Jones's run, by the ravine of either of which, again descend to Casselman's river. Thus avoiding the great northern bend of this river which it makes to pass the gap of Negro mountain. The expediency however, of the route here suggested, is doubted in consequence of the additional summit and tunnel which it would, without strict necessity, involve.

Of the remaining routes to be considered, the next in order as to shortness of course will pass up Will's creek through Will's mountain, thence through Dan's mountain, either by Jennings' or by Braddock's run, and ascending the Savage mountain to its summit at a considerable depression called the Cranberry Swamp draining into Savage river. This little swamp is situated northeastward from the Cumberland road about two miles and is by estimation 2478 feet above tide, or 1900 feet above the Cumberland bench-mark. A cut through of 50 feet in depth, and of moderate length through little Savage mountain near its junction with the great Savage, will carry the line upon the level of 1900 feet above Cumberland, to the slope of the western waters; whence it may descend by the ravine of Piney run, or by that of Flaugherty creek: If by the latter, as is probably the best, it will descend 169 feet in the distance of 4 miles at the rate of 42¼ feet per mile and intersect the other route at its summit at Albright's: Or it may not intersect short of the entrance of the Narrows 5 miles further and 100 feet lower; in which case the distance to the intersection will be 9 miles with a descent of 269 feet at the rate of 30 feet per mile.

The eastern approach to the summit will approximate to a line having these grades and distances, viz: 3 miles ascending

150 feet at 50 feet per mile, 8 miles ascending 736 feet at 92 feet per mile, ½ mile ascending 20 feet at the rate of 40 feet per mile, and 10.8 miles ascending 994 feet at the rate of 92 feet per mile, to the summit, thence *level*, half a mile through the swamp and the cut in little Savage mountain.

4. Synopsis of the route for a Railroad from one mile below Cumberland to ¼ mile below the mouth of Casselman's river—By way of Wills' Creek, and by the pass of either Jennings' or Braddock's run, to the summit of Savage mountain, at the Cranberry Swamp, two miles N. E. from the national road, and thence by Flaugherty creek—and without a tunnel, viz:

Distance in miles.		Per mile. feet.	Total of Grade. feet.	Dist. fr. Cumb'd miles.	Height ab. Tide. feet.	
3.	ascent	50	150	3.	728	Across Braddock' run, or otherwise at pleasure.
8.	ascent	92	736	11·	1464	
0.5	ascent	40	20	11.5	1484	
10.8	ascent	92	994	22.3	2478	Summit of Savage at Cranberry swamp.
0.5	level, cut 50 feet			22.8	2478	through little Savage mountain
9.	descent	30	269	31.8	2209	Down Flaugherty to Allegany mountain.
	Thence with the route by Albright's.					
3.	descent	50	150	34.8	2059	Opposite W. end of summit level of canal.
4.	descent	50	200	38.8	1859	cross Cass. river to left side.
12.125	descent	14.18	172	50.925	1687	opposite mo mid. fork creek.
19.585	descent	21.445	420	70.51	1267	to ¼ m. below m of Cas. river

Height of summit 2478 feet above tide, or ascent from one mile below Cumberland, westward, 1900 feet.

This route by the Cranberry swamp on Savage, is therefore 5.8 miles longer than the route by Albright's with a tunnel, 2.2 miles shorter than the route by Wills' creek and Bowman's mill, and 19.2 miles shorter than the Deep creek route. Moreover, it has a summit 169 feet higher than that of the route by Albright's, 119 feet higher than that by Bowman's, but 22 feet *lower* than that by Deep creek; at the same time the Deep creek route surmounts a second summit of 125 feet in passing to Bear creek, and hence the route by Cranberry swamp actually overcomes, in passing westward, less of height than the Deep creek route by 147 feet.

A route for the Railroad will now be indicated passing Savage mountain by a tunnel half a mile in length, and 300 feet below the crest, from a half to three fourths of a mile south of the National road, crossing Savage river at Vaughan's saw mill, turning the southwestern end of Little Savage mountain, and crossing the summit of Little Backbone, the dividing ridge of the eastern and western waters, by a cut of some 34 feet in

depth, near Beall's tavern, and thence by Flaugherty creek, &c. The approach to the tunnel on the east will be either by the drains of Jennings' or Braddock's run, and around the head of George's creek—west of the dividing ridge the route might be traced down Fishing and Piney runs upon as good terms, perhaps, as by Flaugherty creek.

5. Synopsis of the route by Braddock's or Jennings' run, Vaughan's saw mill, Beall's tavern, and Flaugherty creek.—Passing Savage mountain by a tunnel half a mile in length, a short distance south of the National road, viz:

Distance in miles.	Per mile. feet.	Total of Grade. feet.	Dist. fr. Cumb'ld. miles.	Height ab. Tide. feet.	
3.	ascent 50	150	3.	728	Across Braddock's run or up it at pleasure.
8.	ascent 92	736	11.	1464	
0.5	ascent 40	20	11.5	1484	
8.85	ascent 92	814	20.35	2298	east end of tunnel.
0.5	ascent 40	20	20.85	2318	through tunnel.
0.5	ascent 40	20	21.38	2338	Cross Savage river at Vaughan's.
0.5	level and cut 34 ft		21.85	2338	Summit at Beall's tavern across Nat. road.
10.5	desc't 12.3	129	32.35	2209	down Flaugherty, and intersecting the route that passes by Albright's at the Narrows, east side of Alleghany pass. Thence by that route—
3.	descent 50	150	35.35	2059	Opposite W. end of summit lev. of canal.
4.	descent 50	200	39.35	1859	Cross Casselman's river to left side.
12.125	descent 14.18	172	51.475	1687	Opposite mouth of Middle fork creek.
19.585	descent 21.445	420	71.06	1267	To $\frac{1}{4}$ m. below mo. of Casselman's riv.

This route (by Vaughan's saw mill) passing Savage mountain by a tunnel, is longer than the route by Albright's; also passing the same mountain by a tunnel, by 6.35 miles; and it is longer than the route by Cranberry Swamp, and which has no tunnel by 0.55 miles, or a little more than half a mile. The summit overcome upon this route is higher by 29 feet than upon the route by Albright's, but *lower* than upon the route by Cranberry Swamp by 140 feet.

Respect for the opinions of kind friends anxious to promote the object of the reconnoissance, impels a notice in this place of a route suggested by some of them as the one most practicable

for the action of locomotive steam engines across the Alleghany mountains, namely, by the route of the north branch of the Potomac and by Savage river, to the summit on the National road at Beall's tavern, already described, and thence descend by a suitable drain of a western water, &c.

From the bench-mark one mile below Cumberland, to the mouth of Savage, 33 feet above the level there of the line as surveyed for the canal, is 30.2 miles ascending 360½ feet at the average rate of 11.9 feet per mile. From thence up the ravine and slopes of Savage river to the summit on Beall's, on the National road, the distance by estimation is about 20 miles, and the ascent is 1399½ feet, at the rate of 70 feet to the mile upon the average, and possibly a uniform grade may be obtained.

Upon this route we reach Beall's in a distance of 50.2 miles whereas, by the National or Cumberland road, the distance is only 15 miles, and by a route already indicated for the Railroad with a tunnel near Vaughan's, it is only 21.85 miles, being shorter by 28.35 miles. Moreover, continuing the same route to the common intersection on Flaugherty, at the eastern entrance of the gorge at the passage of this stream through the Alleghany mountain, the distance will be increased to 60.7 miles.

Consequently this circuitous route by Savage river will probably be longer than the route by Cranberry swamp without a tunnel, by 28.9 miles; than the route by Wills creek and Bowman's, also without a tunnel, by 26.7 miles; and than the route by Albright's, *having a tunnel*, by 34.7 miles.

It is not perceived that the grade could be reduced below 70 feet to the mile upon the route in question, without encountering a still further increase of distance, and also of expense, in traversing the deep indentures and rocky cliffs of the mountain slopes.

The inference is therefore drawn that no probable, or even possible advantage in the efficiency of the motive power could justify the adoption of the very long route described.

A route across the mountains at a grade not exceeding 50 feet to the mile.

This route will ascend the valley of Wills creek and the ravine of Laurel run upon the right side of these streams to a point upon the latter just below Wilhelm's saw mill. Here the line will cross Laurel run just below the junction of the ravine from the west, upon the north side of which ravine the route will ascend to the summit at Albright's. The natural summit here, as already stated, is estimated at 2359 feet above tide which, to further the design proposed, should be reduced about

80 feet; that is, to an altitude of 2278 feet above tide, or 1700 feet above Cumberland bench-mark. The summit would then be only 19 feet above the level of Flaugherty creek opposite to this point. The line down this creek westward would consequently run five miles with a descent of 69 feet, at the rate of of 13.8 feet per mile, to the entrance of the Narrows at the Alleghany mountain.

The descent from the summit, eastward, down upon the right sides of Laurel run and Will's creek, will be at the rate of 50 feet per mile for the entire distance, being 34 miles, with a fall of 1700 feet. The line must traverse, in this descent, the slopes of Savage and of Dan's mountains, at considerable heights above the bottoms of the ravines, and it may, consequently, be rendered very expensive to graduate: This fact can however alone be correctly ascertained upon a survey with instruments. In the meantime, seeing there is nothing in the usual form of those mountains to forbid it, we shall assume the feasibility of the project. The line at the point opposite to the mouth of Laurel run will then (such is the rapidity of the fall in that stream) be some 320 feet above the level of the water: It will pass fully as high above the level of the mouth of Brush creek, and at least 400 feet above the level of the mouth of little Will's creek. The relative altitude of the line may here be such as to allow it to pass into the vale between Dan's mountain and the Savage, and thence into a ravine, or upon a slope, of Jennings' run; in which case Dan's mountain would be passed in the gap admitting tha run: Otherwise the pass of this mountain would be effected a the break of an intermediate stream.

6. Synopsis of the proposed route for a Railroad at a grade not exceeding 50 feet to the mile from 1 mile below Cumberland to $\frac{1}{4}$ mile below the mouth of Casselman's river—passing up Will's creek and Laurel run, crossing the summit at Albright's, without a tunnel, but with an open cut of 81 feet extreme depth and about $\frac{1}{4}$ mile extreme length—thence down Flaugherty creek, viz:

Distance in miles.		Per mile in feet.	Total of grade in feet.	Dist. from Cumber. miles.	Height above tide in feet.	
34	ascent	50	1700	34	2278	Summit at Albright's.
5	descent	13.8	69	39	2209	down Flaugherty to Alleghany moun.
3	descent	50	150	42	2059	To op. W. end summit level of canal line.
4	descent	50	200	46	1859	cross. Casselman's river to left side of it.
12.125	descent	14.18	172	58.125	1678	mo. mid. fk. ck.
19.585	descent	21.445	420	77.71	1267	To $\frac{1}{4}$ m. below the mo.of Casselman's riv.

The preceding route by Albright's has no grade exceeding 50 feet to the mile, and is in length 77.71 miles, and without a tunnel.

The route by Albright's, with a tunnel, has for extreme grade, 92 feet to the mile, and is in length 64.71, and is shorter than the preceding route by 13 miles.

The route by Will's creek and Bowman's, without a tunnel, has 92 feet to the mile as the extreme grade, and distance 72.71 miles, and is shorter than the same route by 5 miles.

The route crossing Savage mountain at the Cranberry Swamp, without a tunnel, and with grades of 92 feet to the mile, is 70.51 miles in length, and is therefore shorter than the route aforesaid (with grades of only 50 feet) by 7.2 miles.

The route by Vaughan's, having a tunnel, and grades of 92 feet per mile, is in length 71.06 miles, and therefore shorter than the same route by 6.65 miles.

Lastly, the route by Deep Creek, without a tunnel, but with grades of 92 feet per mile, and in length 89.7 miles is *longer* than the foregoing described route having grades no higher than 50 feet per mile, by 12 miles.

Whilst the probability is expressed that the foregoing described route of 34 miles to the summit, and of 77.71 miles to the intersection $\frac{1}{4}$ mile below the mouth of Casselman's river, is the shortest that can be had with a maximum grade per mile of 50 feet; yet it is barely possible that a shorter line under the same limit of a grade can be traced up Will's creek, by Bowman's and across the Scaffold run; passing the divided ridge at a point already described, $\frac{3}{4}$ mile from Baer's, and perhaps with a short tunnel, and thence down Flaugherty, &c. at a grade of 50 feet per mile, and intersecting with a route passing Albright's at a distance from 1 mile below Cumberland upon that route of 33 miles. This route, if practicable, would, perhaps, be some 3 or 4 miles shorter than the other route having the same limits of grade: The deeply furrowed chasms presented by the Scaffold and the Laurel runs, however, deter from any thing beyond a slender hope of obtaining such a result: At the same time, in case of future surveys, it would be well to ascertain the facts.

The lengths, grades, and heights overcome upon the six practicable routes for a railroad herein before described, extending from 1 mile below Cumberland to $\frac{1}{4}$ mile below the mouth of Casselman's river, may be exhibited in a tabular form, as follows, viz:

No.	Designation of the places passed upon the Routes respectively.	Length of Route in miles.	Grades and Distances.				Heights in feet overcome in both directions.
			25 feet per mile and under.	50 feet per mile and over 25 feet.	75 feet per mile and over 50 feet.	92 feet per mile and over 75 feet.	
			Miles.	Miles.	Miles.	Miles.	
1	North br. of Potomac, Savage, Crabtree, Deep Creek, Baer Creek, and Youghiogheny river.	89.7	50.7	10.	7.	22.	3108½
2	Will's Creek, Bowman's, Flaugherty Creek, and Casselman's river.	727.	49.71	0.	11.	12.	2873
3	Will's Creek, Jennings' run, Albright's Flaugherty, and Casselman's. *With a Tunnel.*	64.71	36.71	8.5	3.	16.5	2773
4	Jennings' or Braddock's run, Cranberry Swamp, Flaugherty, and Casselman's river.	70.51	32.21	19.5	0.	18.8	3111
5	Braddocks and Jennings' run, Vaughan's, Beall's Tavern, Flaugherty, and Casselmans.—*With a Tunnel.*	71.06	12.71	11.5	0.	16.85	2831
6	Will's Creek, Laurel run, Albrights, Flaugherty, and Casselmans. Maximum grade 50 feet per mile.	77.71	36.71	41.	0.	0.	2711

Of the route from Turkeyfoot to the Monongahela River.

From the level of 1267 feet above tide at $\frac{1}{4}$ mile below the mouth of Casselman's river; that is, below Turkeyfoot, the canal line pursues the right bank of the Youghiogheny river to its mouth, and thence along the right bank of the Monongahela river, to the city of Pittsburg, as follows, viz:

To Connelsville:
Distance $27\frac{1}{2}$ miles, descent 432 feet.
above tide 835 feet.

From Connelsville to Sewickly creek.
Distance $27\frac{1}{4}$ miles, descent 144 feet.

$54\frac{3}{4}$ above tide 691 feet.

From Sewickly creek to mouth of Youghiogheny.
Distance $16\frac{1}{2}$ miles, descent 8 feet.

$71\frac{1}{4}$ above tide 683 feet.

From mouth of Youghiogheny to Pittsburgh.
Distance 14 miles, descent 35 feet.

Total = $85\frac{1}{4}$ miles. River above tide 648 feet.

The descent and distance down Youghiogheny River from $\frac{1}{4}$ mile below the mouth of Casselman's river to Connelsville, is as follows, according to the survey for the canal.

Distance in yds.	Total m.	Total yds.	Descent in ft.	Total descent ft.	
3599	2	79	16	16	At total distance 7 miles
2030	3	349	8	24	is the old Salt works.
1749	4	338	16	40	And at about $10\frac{1}{4}$ miles
5966	7	1024	32	72	is the Ohiopile falls of 32
3720	9	1224	24	96	feet, 16 of which is pen-
1660	10	1124	96	192	pendicular.
14800	19	84	176	368	To mo. of Indian creek.
4514	21	1078	32	400	
2680	23	238	8	408	
1207	23	1445	8	416	nr. paper mill & can. hol.
3250	25	1175	16	432	W. side of Laurel hill.
3225	27	880	0	432	To Connelsville.

		feet.
Point ¼ mile below Turkeyfoot, is above tide	=	1267
Descent in about 10 miles to near the head of the Ohiopile falls		96
Head of falls, above tide	=	1171
Fall in 1 mile (as measured on canal line but near 2 miles if measured on the left bank		96
Foot of rapids below falls, above tide	=	1075
Fall to mouth of Indian creek at about 8 miles further		176
Mouth of Indian creek, above tide	=	899
Fall in about 8 miles further to Connellsville		64
Connellsville above tide.	=	835

The Railroad might descend to Pittsburgh by the valley of the Youghiogheny, but as the right side of this stream and then the same side of the Monongahela may be occupied by the western section of the Chesapeake and Ohio Canal, and as the main stem of the Railroad will doubtless be carried to the Ohio river as low down as Wheeling, it may be proper that the branch at Pittsburgh should occupy the valley of the Monongahela river. With this view, the most obvious, and therefore the first suggested intersection of that river with the main stem of the railroad was at the mouth of the Redstone creek, one mile below Brownsville, and the crossing of the Cumberland road. Should this point be selected, the main stem of the road will cross the Monongahela, at the ripple immediately below the mouth of Redstone creek, where the viaduct of about 650 feet in length, and 50 feet in height above low water will cross at right angles with the line of the river, and will land upon a fine high piece of bottom land, every where suitable for the curvatures and manœuous incident to the intersection of two important lines of railway. The viaduct will cross from the convex to the concave side of the river where it deflects quickly from an eastern to a northern course, thereby favoring the curve, by which the line of the road will be continued westwardly up the river to the mouth of Ten mile creek towards Wheeling, as well as that by which the branch road will descend the river towards Pittsburgh.

It was found easy to pass from the Youghiogheny river to the Redstone creek, especially by keeping a somewhat high level through the gap of the Laurel hill, and to the crossing of

Dunbar creek, at its junction with Guest's run. This level will be about 150 feet above that of the Youghiogheny at the mouth of Dunbar, $\frac{3}{4}$ of a mile above Connelsville, and 140 feet above the river level, 2 miles above that town, and opposite to where the route will deflect from the river slope of the mountain spur, in order to pass up the valley of Dunbar. Opposite to the mouth of Indian creek the line so run will be 90 feet above the level of the river. It is believed that this level can be maintained to the fork of Dunbar at Lowry's mill, (Strickler's), where, since the stream is 120 feet higher than at its mouth, the Railroad level will cross upon a bridge 30 feet high. Thence the line will ascend Guest's run to its head upon the Mount Braddock farm, at the summit between this run and Lick run, that is, between Dunbar and Redstone creeks. This summit is in a field immediately south of the road leading from Uniontown to Connelsville, a short distance west, and in view of Mount Braddock mansion; is estimated to be 320 feet above the level of the Youghiogheny at Connelsville, and 230 feet above that of Redstone creek at the mouth of Lick run; and is, therefore, 1155 feet above tide. Reducing the summit 30 feet by an excavation, there will be a rise of 136 feet from the bridge at Dunbar, being 3 miles at 45.3 feet per mile up the valley of Guest's run. The descent to Redstone creek will be 200 feet at 50 feet per mile for 4 miles down Lick run to its mouth, (or the route may pass down Rankin's run). Thence the line will descend Redstone creek 13 miles to its mouth, viz: 11.5 descending 193 at 16.8 feet per mile to Linn's mill, situated at the head of the highest back water of the river freshets. The level of the line will here be 20 feet above low water: Thence 1.5 miles descending 10 feet at 6.7 feet per mile to the bank of the Monongahela river 10 feet above the highest water mark, and level one fifth of a mile to the opposite bank of the river: Crossing upon a viaduct 650 feet in length as already described.

The line as now described will be connected with that part of it, passing down upon the left bank of the Youghiogheny river by means of the following grades and distances, viz: From $\frac{1}{4}$ mile below Turkeyfoot to near the head of the Ohiopile falls 9.3 miles descent 96 feet at 10.3 feet per mile; then passing the falls and rapids, and crossing Meadow, Cucumber, and Jonathan's runs 7.3 miles, descent 182 feet at 25 feet per mile; and 3 miles level, crossing Laurel run, to a point opposite to the mouth of Indian creek, and 90 feet above the level of the river, thence 6.5 miles level, through the Laurel hill, passing Canoe hollow to the rounding part of the mountain spur at 140 feet

above the level of the river; and thence curving to the left from the river to the Dunbar slope, pass 2 miles level upon the latter to Lowry's mill, where Dunbar creek will be crossed as already mentioned.

Synopsis of a route for the Railroad from ¼ mile below Turkeyfoot to the left bank of Monongahela river, one mile below Brownsville—by Youghiogheny river, Dunbar creek, Mount Braddock, Lick run, and Redstone creek.

Distance in miles.		Per mile. feet.	Total of Grade. feet.	Height ab. Tide. feet.	
				1267	at ¼ m. below Turkeyfoot.
9.3	descent	10.3	96	1171	near head of Ohiopile falls.
7.3	descent	25.	182	989	Pass falls & cross meadow, Cucumber & Jonathn's runs.
3.	level			989	Cross Laurel run to op. mo. of In. cr. at 90 ft. ab. river.
6.5	level			989	Pass canoe hollow to rounding of mounting spur 140 feet above river.
2.	level			989	Curving to left up slope of Dunbar cr. to Lowry' mill, & cross Dunbar 30 ft ab it.
3.	ascent	45.3	136	1125	Summit at Mt. Braddock, after cutting 30 feet deep.
4.	descent	50.	200	925	Passing down Lick run to Redstone creek.
11.5	descent	16.8	193	732	Passing down Redstone creek to Linn's mill, at 20 feet above low water in cr.
1.5	descent	6.7	10	722	To Monongahela river at 10 feet above the highest water mark.
0.2	level			722	Cross river at ripple immediately below the mouth of Redstone creek.
48.3 miles.					

	Miles.
Distance from bench-mark one mile below Cumberland to ¼ mile below Turkeyfoot on the Youghiogheny river,	64.71
Less 1 mile =	1.00
Distance from Cumberland to ¼ m. below Turkeyfoot, =	63.71
Distance from ¼ m. below Turkeyfoot to Monongahela river, one mile below Brownsville,	48.30
From Cumberland to west bank of Monongahela, =	112.01

Of other routes from the Youghiogheny river to the Monongahela.

The Laurel hill was carefully examined from the National road to the pass of the Youghiogheny river, in order to discover whether it were practicable to pass from the Ohiopile falls by the ravines of Meadow or of Cucumber run into the drains of Dunbar, or of Redstone creek, but this was found quite out of the question, as the summit to be unavoidably passed to effect such an object is some 750 feet above the level of those falls, or 1900 feet above tide, whilst the several streams mentioned in their courses to the Youghiogheny, exhibit the wildest features of the mountain torrent. The passage of the most western mountain, therefore, by this route, must be effected at the natural gap througn which the river flows. Having effected the pass of the mountain, a choice of routes is presented. A direct course from Connelsville to Wheeling intersects the Monongahela at Brownsville, and since the line must necessarily approach within about 2 miles of Connelsville, and it may be laid still nearer to that town, consequently no other practicable approach to the Monongahela seems more in course than that at Brownsville, or at the mouth of Redstone creek, only one mile distant. To reach Redstone creek the lowest summit by 50 feet, perhaps, is that at mount Braddock upon the route already described. There is another pass about 50 feet higher, connecting Guest's run with Cove run; thence down Shutes' run to Redstone creek; whence the route may continue down that stream, or it might be run by Uniontown and over another summit to Dunlap's creek or to Brown's run, and down either of these to the Monongahela. But the line would be lengthened and the grades increased by either expedient. At the same time, it is not intended to say that the route by Lick run and Redstone creek which has been more particularly inspected upon the ground, and therefore more minutely described here than any other route, should be the one finally selected for the Railroad: So far from that are the views now entertained, that it is considered as highly probable that a route even two miles shorter can be found. Be that, however as it may, there are other circumstances proper to be considered beside mere *distance*, that should enter into the motives which will finally govern the location of the route. It is desired that the ideas here intended to be conveyed shall attach to the contemplation of any other route or portion of the line between Cumberland, Wheeling, and Pittsburgh: Little more being intended in this reconnoissance than the discovery of a practicable route, therefore, different sides of streams or different routes altogether from those

described or to be described in this report, may ultimately be selected for the track of this highly important work. Resuming the subject of practicable routes across this peninsula, it may next be stated, that at the instance and with the assistance of Maj. Torrance, and Cols. Miller and Rogers, a route was examined continuing down the Youghiogheny river, across Dunbar creek near its mouth, and rising round the base of the higher grounds west of the river, and in view of Connelsville, passing by a gentle curve to the left into the valley of mill run, which the line will ascend to its head, and to the summit of the ridge dividing this run and Craig's branch of Redstone creek, at Henderson's farm; and at a depression estimated to be about 350 feet above the level of the river at the mouth of Dunbar; and supposed to be 50 feet higher than the ridge at mount Braddock. Then pass down Craig's branch, or otherwise proceed along the ridge, and descend by Poland's run to Redstone creek, near Work's mill; about $1\frac{1}{2}$ miles below Middletown. This route is supposed to be practicable and merits a more minute examination in case surveys shall be ordered.

Furthermore the route may continue along the river below Connelsville to some suitable place to commence the ascent to the summit pass to the Monongahela, say at Virgin's run, Washington's run, or some other point, whence the line will cross the ridge, and descend to Redstone creek by the ravine of Allen's run, Crab-apple run, or by some other route: Otherwise the line may pass down Little Redstone creek to the Monongahela; and thence up that river towards Wheeling, and down it towards Pittsburgh. In relation however to the route now suggested, it is doubted whether the dividing ridge is not too high to admit of a proper grade upon the short distance of only 3 or 4 miles down the Little Redstone creek from its head to the Monongahela river.

Of that part of the route for the Railroad extending from the Monongahela river 1 mile below Brownsville to Wheeling, upon the Ohio River.

The Monongahela river to the mouth of Ten mile creek, 10 miles above the mouth of Redstone creek, lies in a good direction for Wheeling; the route will therefore ascend this river, 10 miles and the grade may be level, inasmuch as at the commencement the line is 10 feet above high water, and the fall in the river being about 10 feet, the level of the line at Millsborough or at the mouth of Ten mile creek will be about 40 feet above low water mark, and some 2 or 3 feet higher than the highest known

freshets at this point in the Monongahela. At 1 mile the line will pass Brownsville, situated on the right bank, and at 8 miles further, Fredericktown upon the left bank of the river: Millsborough immediately below the mouth of Ten mile creek is likewise upon the left bank. The route will then ascend the valley of Ten mile creek about 3 miles to the junction of the north and south forks at Clarkesville, and at the termination of the backwater of the highest freshets of the Monongahela. The grade to this point will be *level.* Both forks of Ten mile creek have been examined to their head, as well as the appropriate connections with Wheeling creek, and the route of either was deemed practicable, and nearly equally so, for the Railroad.

The valley of the North fork, though very crooked, is not quite so much so as that of the South fork; the latter presenting a deep, narrow, and remarkably crooked ravine, from near Waynesburgh to Clarkesville, a distance of about 13 miles. The summit at the head of Crafts creek, a branch of the North fork of Ten mile creek, though about the same height above tide as that at the head of Gray's branch of the South fork, at Braddock's, yet the grades will be easier, and the expense of graduation less in passing to the waters of Wheeling creek, by the former than by the latter. The length of the route as examined, is about equal by either fork of Ten mile creek. New and more close surveys may hereafter indicate sufficient differences to justify a decided preference; if not, expediency may determine the question. At present we shall speak of the route of the North fork.

From Walton's mill, opposite to Clarkesville, the line will ascend 7½ miles to the junction of the North fork and the Middle fork, whence it will pass up the latter 13 miles to the mouth of Craft's creek, and up this last to the dividing ridge between the Ohio and Monongahela rivers, or between Ten mile and Wheeling creeks. The ridge here presents, comparatively, a very low gap, and the pass is effected at a school-house, upon the land of Ephraim Post. The natural summit is estimated at 1204 feet above tide, or from 500 to 600 feet above the Monongahela and Ohio respectively. In forming this estimate, the known approximate heights above tide, of these two rivers, were employed, but no intermediate instrumental levellings have been made, or at least, such have not been examined. There may well be error, therefore, in assigning the heights of the summits in this region of country; yet from the care exercised in forming the judgment, it is confidently believed that no very serious departure has been made from correct results.

The line across the ridge, may be laid at a grade not exceeding 50 feet per mile, with an expensive cut of about half a mile in length, and 50 feet in extreme depth: In this case the grade for 17 miles will vary from 10 to 15 feet per mile, and for $3\frac{1}{2}$ miles further to the mouth of Craft's creek, it would be about 24 feet per mile. Thence up this creek $3\frac{1}{4}$ miles ascending at 50 feet per mile, to the summit: Whence the line may descend into the ravine of Templeton's fork of Wheeling creek, viz: half a mile with a descent at the rate of 50 feet per mile, passing down a small ravine to its junction with a larger stream, and where the ground is 5 feet below the grade, thence 2 miles at a descent of 50 feet per mile to Ely's. The valley in these two miles falls very uniformly at the rate of 75 feet per mile, and therefore with the grade of 50 feet, the line at Ely's would be 55 feet above the level of the bottom land, thence $2\frac{1}{2}$ miles descending at 50 feet per mile, and half a mile at 40 feet per mile to the junction of Enlows fork on the right, with these grades the line for $4\frac{1}{2}$ miles passing Ely's, would rest upon the hill sides, and upon high embankments across the lateral ravines. A great expense in the construction would therefore be saved by cutting only 35 instead of 50 feet deep upon the summit, and employing a grade for the Railroad corresponding to that of the valley at Ely's viz: 75 feet per mile. The length of the cut of 35 feet deep would not exceed 700 feet, and the grades would be as follows; that is to say, from Walton's mill near Clarkesville, to the mouth of Craft's creek, $20\frac{1}{2}$ miles, the ascent will be from 10 to 15 feet per mile. Thence up this stream $1\frac{1}{2}$ miles at a grade of 64.6 feet per mile to Craft's mill, and 22 feet above the level of the bottom lands; thence $1\frac{5}{8}$ miles ascending still at 64. 6 feet per mile to the head of the ravine, and 27 feet above the lowest ground in the gully at this place, thence $\frac{1}{8}$ of a mile at the same ascent of 64. 6 feet per mile to the summit, with a cut of 35 feet in depth, near a school-house on the land of Ephraim Post; thence level $\frac{1}{16}$ of a mile to the western extremity of the excavation in the bottom of a ravine draining into Templeton's fork of Wheeling creek, already mentioned: thence down the said ravine $\frac{1}{16}$ of a mile descending at the rate of 75 feet per mile, to the valley of a larger stream, above which the line will here be 12 feet: thence 2 miles descending at 75 feet per mile to Ely's and 12 feet above the level of the bottom lands here; thence 3 miles descending at 34 feet per mile to the junction of Enlows fork on the right.

From this point the grades to Wheeling will be very easy, being in no place more than 20 feet to the mile, as follows; 2 miles descent 20 feet per mile, to the junction of Hunter's

fork on the left, and half a mile descending at the rate of 14 feet per mile to the mouth of Owens' run on the left, at Ackley's. Here the route by the South fork of Ten mile would intersect. Thence 6½ miles descending at 10 feet per mile to the *State line* at Steel's house, and half a mile below the junction of Robeson's fork on the right. Thence in the state of Virginia, one mile descending 20 feet to the junction with the Duncard fork on the left, near Howard's mill. Thence 3 miles descending at 6.7 feet per mile to Dage's, 5 miles descending at 8 feet per mile to Griffith's mill, and 5 miles descending at 7 feet per mile to Col. Cruger's, (formerly Col. Shepperd's) at the junction of Little Wheeling creek, on the right. Rodefer's bend is situated one mile below Griffith's and Caldwell's farm, 2 miles below Rodefer's. Then *one mile* descending 10 feet to a point opposite to the extreme extention up Wheeling creek of the back water of the Ohio river, in the great freshet of February, 1832. Thence *level*, 4 miles to market street, in the town of Wheeling. The distance from the Monongahela opposite the mouth of Redstone creek, by the route aforesaid, being, by estimation, 70¼ miles. The distance by the Cumberland road is 57, and by a straight course 47 miles: and it may be possible to shorten the route of the Railroad to about 62 miles.

Synopsis of a route for the Railroad from the Monongahela, 1 mile below Brownsville, to the Ohio at Wheeling—By the route of the Monongahela, Ten mile creek and its north and middle forks, and by Wheeling creek.

Distance in miles.		Per mile in feet.	Total grade in feet.	Total distance in miles.	Height above tide in feet.	
					722	Monongahela bk. op. mo. of Redstone creek.
1.	level	"	"	1.	722	Opposite Brownville
9.	level	"	"	10.	722	Millsboro' at mo. of Ten mile cr.
3.	level	"	"	13.	722	Passing up Ten mile cr. to Walton's mill at Clarkesville, at head of back water of river highest freshets, and 10 ft. above low water in North fork of Ten mile. Thence up the North fork.
3.	ascent	15.	45.	16.	767	To Wise's mill; then 4½ m. to junction of the N. and Middle forks.
8.	ascent	10.	80.	24.	847	To Thos. McGiffin's farm on N. fk. of Ten mile cr.

6.	ascent	10.	60.	30.	907	To Wm. Lindley's on same fork.
3½	ascent	15.	52.	33.5	959	To mo. of Craft's cr. then up it.
1.5	ascent	64.6	97.	35.	1056	To Craft's mill and 22 ft. above level of the bottom lands.
1.6¼	ascent	64.6	105.	36.6¼	1161	To head of ravine, 27 ft. above bottom of it at this place.
0.1¼	ascent	64.6	8.	36.75	1169	To summit with 35 ft. cut near school house & Ephraim Post's.
0.06	level			36.81	1169	To surface of grds in ravine of Wheeling creek.
0.44	descent	75.	33.	37.25	1136	To junction with Templeton's fk. of Wheeling cr. at 12 ft. above bottom.
2.	descent	75.	150.	39.25	986	To Ely's, and 12 ft. above bottom lands.
3.	descent	34.	102.	42.25	884	To junction of Enlows fork on right.
2.	descent	20.	40.	44.25	844	To junction of Hunter's fork on left.
0.5	descent	14.	7.	44.75	837	To junction of Owens' run on left at Ackley's. Here the route by the South fork of Ten mile would intersect.
1.75	descent	10.	17.	46.50	820	To Teagarden's mill on right.
4.25	descent	10.	43.	50.75	777	To junction of Robeson's fork on right.
0.5	descent	10.	5.	51.25	772	To Steel's at *State line.* Then in Va.
1.	descent	20.	20.	52.25.	752	To junction with Duncard fk. on left.
3.	descent	6.7	20.	55.25	732	To Dage's.
5.	descent	8.	40.	60.25	692	To Griffith's mill.
1.	descent	7.	7.	61.25	685	To Rodefer's
2.	descent	7.	14.	63.25	671	To Caldwell's
2.	descent	7.	14.	65.25	657	To Crugers (formerly Shepperds) at junction of Little Wheeling cr. right.

1.	descent 10.	10.	66.25	647	To head of back water of Ohio, in Feb. 1832.
4.	level		70.25	647	To Market street in Wheeling

	Miles.
Distance from Cumberland to W. bk. of Monongahela =	112.01
Distance thence to Wheeling, as above, =	70.25
Total distance from Cumberland to Wheeling =	282.26

And there is hope that the distance may be reduced to 175 miles.

STATEMENT of the distances, grades, and heights to be overcome between Cumberland (at a point 578 + 50 = 628 feet above tide) and Wheeling, by the shortest route across the mountains.

The portions of the route as they have been separately considered.	Distance in miles.	Grades and Distances. 25 feet per mile & under	50 feet per mile and over 25	75 feet per mile and over 50	92 feet per mile and over 75	Heights overcome. Ascents going west'd. feet.	Ascents going east'd. feet.	Total ascents in both direc's.
		Miles.	Mls.	Mls.				feet.
From Cumberland to the Youghiogheny river, ¼ mile below Turkeyfoot; by Wills's creek, Jennings' run, Albright's, Flaugherty, and Casselman's river, with a tunnel ½ m. long at Savage mountain, -	63.71	36.71	7.5	3.	16.5	1681	1042	2723
From ¼ m. below Turkeyfoot to west bank of Monongahela river, 1 m. below Brownsville; by Youghiogheny river, Dunbar Cr'k, Guest's run, Mount Braddock, Lick run, and Redstone creek,	48.3	41.3	7.	0.	0.	136	681	817
From Monongahela 1 mile below Brownsville, to Ohio, at Wheeling; by Monongahela river, Ten Mile creek, North and Middle forks of Ten mile, & by Wheeling creek, down Templeton's fork.	70.25	61.56	3.	5.69	0.	447	522	969
Totals =	182.26	139.57	17.5	8.69	16.5	2264	2245	4509

Of the Curvatures.

Having discussed the matter of distances and grades upon the line of the main stem, as proposed frsm Cumberland to Wheeling, it may be proper previous to speaking of the motive power, and of the probable expense of construction, to offer something in relation to the curvatures; and it need scarcely be remarked, that these should be as moderate in their departure from directness, as may be possible, having a due regard to the difficulties to be surmounted in the construction. It is believed that from Cumberland to the mouth of Ten mile creek, a distance of 122 miles, the radius of curvature need not be less than about 1000 feet. At the same time, unless several bridges shall be built across the stream for the purpose of ensuing a less degree of curvature, it is probable that a radius of 600 feet must be employed in the ravine of Redstone creek. This part of the main stem, however, being doubly important as uniting the business of two lines, it would be well to reduce the curvature upon it at considerable cost in the graduation and bridging. How far expense should be incurred in attaining a greater directness of course, say from a radius of 600 to that of 100 feet, for instance, it is not necessary to discuss on the present occasion; but it is a question that must be determined with a due regard to the efficiency of the motive power, and to the effects upon cost of machinery and of construction, whenever the time shall come to determine the exact position of the line, after a full knowledge of the country along the route is obtained from actual survey and levelling. The ravines of Ten mile and Wheeling creeks are exceedingly crooked in many parts of their course; and many bridges must be constructed, and some necks of land cut through in order to procure a feasible route: Nevertheless it is considered doubtful whether along each of those streams it will not be found indispensable that curves of 600 feet radius should be admitted. It should always be borne in mind that where a bridge is built, a stream diverted from its course, or a cut is made to lessen the curvature, in traversing a valley, the expense saved in building and maintaining two tracks of railway upon the distance cut off by the manuœuvre, will sometimes go far to justify the bolder work upon the more direct and shorter line: And upon a judicious determination of such cases, will the public utility of the work, and the profits of the undertaking very much depend. As it would be better if the steeper grades, and especially those upon which assistant Locomotives shall be used, were upon straight lines of road, or otherwise upon curves of large radii, a care should be had that the best lines in this re-

spect should he obtained that circumstances might admit of; and that, where curves of the smaller radii must be introduced, the grades, if practicable, shall be lessened in inclination so that a uniform resistance shall stand opposed to a motive power, which is likewise uniform and necessarily limited in its intensity.

Of the motive power, and its application.

Under this head I am admonished, both from the length this report has already attained, and from the fruitfulness of dissertation incident to this branch of the subject, to be as brief as possible. And shall begin with stating the performances of Locomotive Steam Engine upon the Baltimore and Ohio Railroad, and likewise upon the Baltimore and Washington Railroad.

In my last annual report it is stated of the Locomotive Engine "Arabian" that it "conveyed at the rate of 11.79 miles per hour, on a level part of the road, a train weighing, including cars, but excluding the weight of the Engine and Tender, 112 tons 18 cwt. 1 qr., the supply of steam being redundant, and pressure 50 lb. to the circular inch. With this load the engine advanced, but at a diminished speed, to the summit of 10 feet high in the deep cut, upon the railway ascending at the rate of 17 feet per mile, and curved with a radius rather less than 1000 feet." See 8th Annual Report of President and Directors to the Stockholders, page 24. The level portion of the Baltimore and Ohio Railroad, here mentioned, has likewise curvatures of a radius of about 1000 feet. The "Arabian" is a 7 ton engine, and with water in the boiler and fuel in the fireplace, weighed 7½ tons. The diameter of the cylinders, each 12 inches; stroke 22 inches. The Engine worked with the adhesion of all the four road wheels of 3 feet in diameter.

	lb.
The friction, or resistance, on a level straight road is about the $\frac{1}{240}$, or per ton, - -	9.5
The resistance from curvature on the road above mentioned, and from the greater elasticity of the plate rail, - - - - - -	2.5
Total resistance of the level, per ton, -	12.
Upon the ascent of 17 feet per mile, the gravity =	7.

Total resistance per ton on the ascent of 17 feet per mile, and in a curve of 1000 feet radius } = 19.

The traction exerted on the level, and at the speed of 11.79 miles per hour, was therefore 112.9 tons × 12 lb. = - - - - } 1356

(And this traction is the measure of the *adhesion* employed beyond the conveyance of the Engine and tender of 12 tons weight.)

The gravity upon an ascent of 17 feet per mile of the whole mass moved, (including engine and tender) = 124.9 × 7 } = 875

And the adhesion employed in ascending the deep cut = 2231

The weight of the Engine = 7½ tons = 16,800 lb.

Therefore the *ratio* of the adhesion employed on the level at a speed of 11.79 miles per hour, was the $\frac{1356}{16800} = \frac{1}{12.4}$ or something less than the one twelfth part of the weight of the Engine.

Moreover, the ratio of the adhesion drawn into action upon the ascent of 17 feet per mile, "at a diminished speed, was the $\frac{2231}{16800} = \frac{1}{7.5}$ or between a seventh and an eighth part of the entire weight of the Engine. Now the speed being inversely as the increase of resistance, it will be 2231 : 1356 :: 11.79 : 7 miles per hour for the velocity up the ascent; and it is stated in the 8th annual report aforesaid, page 10, to have been between 6 and 7 miles per hour.

The foregoing performance is equivalent to conveying on the level at a speed of 11.79 miles per hour, 26 cars laden with 78 tons of freight; or, allowing 5 passengers to the ton gross (including cars and baggage), 565 passengers at the same speed: It follows that the Arabian would draw these 78 tons of freight, or 565 passengers, up the ascent of 17 feet per mile at a velocity of 7 miles per hour. And it may here be remarked that one of the Engines of the same class did, upon a recent occasion, convey a train of cars containing between 500 and 600 persons from Ellicotts' mills to Baltimore, passing up the ascent already mentioned, and one or two others of like acclivity; and through a level part of the road curved with a radius of 400 feet.

The same effort is likewise equal to the conveying upon a level at a speed of,

10 miles per hour, 135 tons gross, or 675 passengers.
14 miles per hour, 73 tons gross, or 465 passengers.
17 do do 75 do or 375 do.
20 do do 61 do or 305 do:

The Arabian Engine would, with equal ease, have conveyed up grades ascending at 20 feet per mile upon the Washington Railroad, where the resistance from friction, curvature, and gravity combined is about 19½ lb. per ton; the following loads at the speeds annexed, viz:

7 miles per hour, 114 tons gross, or 570 passengers.
10 76 380
14 51 255
17 40 200
20 32 160

Upon the occasion of the opening of the Washing Railroad to Washington, on the 25th ult. one of the new engines drew at the rate of 20 miles per hour up ascents of 20 feet per mile, for 5 miles together, 5 double cars and about 250 passengers: the gross load exclusive of engine and tender being about 47 tons, and with the engine and tender, say 60 tons.

The resistance, on a level (allowing for curvatures) being 11 lb. per ton, and upon the ascent 19½, the gravity being 8½ lb.; we find that the traction exerted upon this occasion, beyond the resistance of the engine and tender upon a level, was 1027 lb.; and therefore, this engine with an equal effort would have conveyed upon a level, at the speed of 20 miles per hour,

$$\frac{1027}{11} = 93 \text{ tons gross, or } 465 \text{ passengers.}$$

The foregoing not being considered a full test of the tractile power of the new engines, one of them, called the "George Washington," was assigned to draw a heavy train between the Patapsco and Washington, about 30 miles, that being the extent of the lateral road. The train consisted of 30 laden freight cars and one passenger coach, the gross weight of which was 113 tons—The weight of the locomotive engine was 8½ tons, and of the tender, say 5½ tons: entire mass moved 127 tons. The least radius of curvature upon this road is 1273 feet, and the greatest ascent 20 feet per mile or 1 in 264. The resistance on a level, as already stated is about 11 lb. per ton, and on the ascents of 20 feet per mile, 19½ lb. The grades are almost all either level or 20 feet per mile, of which latter there are about 5 or 6 consecutive miles in either direction. The engine led off this enormous train in handsome style, passing the 10th mile post (counting from Baltimore) at 7 minutes past 12 o'clock, and arrived in Washington at 51½ minutes past 2 o'clock;

having performed the 29 miles in 2 hours 44 minutes 30 seconds: The stoppages amounted to 32 minutes 40 seconds, and the time of running was 2 hours 11 min. 50 sec.; being at the rate of 13.2 miles per hour. The return trip, with the same load, was performed at the rate of 14 miles per hour, whilst the time employed, including stoppages, was 2 hours 30 miles 33 sec.

Regarding the ability of the engine upon the ascending parts of the line, the only portions where its tractile power could with convenience be fully tested, it was observed to require only 26 minutes 8 seconds, to travel 5 consecutive miles, ascending constantly at the rate of 20 feet per mile. The average speed was therefore at the rate of 11.48 miles per hour; and the calculation may be made at follows: viz:

Resistance of the train up the ascent, $= 113 \times 19\frac{1}{2} = 2203$ lb.
Gravity of the engine and tender, $= 14 \times 8\frac{1}{2} = 119$

And the tractile power of the engine on a level besides the friction or resistance on the road of the engine and tender is, $= 2322$ lb.

Therefore as the resistance on a level is 11 lb. per ton, the gross load that the engine is capable of drawing on a level is equal to, $= 211$ tons

And this load will be drawn at a speed of 11.48 miles per hour.

Likewise $\frac{(211 + 14) \times 11.48}{14} - 14 = 170$ tons at 14 m. per h.

And by the same mode of calculation we have - - - - 138 tons at 17 m. pr h.
And 115 tons at 20 on a lev.

This engine is therefore capable of drawing upon a level Railroad, similar to the level parts of the Washington branch, a train containing 149 tons of goods, or 1055 passengers, at a velocity of 11.48 miles an hour. Whilst with a velocity of 20 miles per hour, the load will be 81 tons of goods, or 575 passengers.

Moreover, the same engine will convey up ascents of 20 feet per mile, at the rate of 11.48 miles per hour, 80 tons of goods, or 565 passengers; and at a speed of 20 miles per hour, $42\frac{1}{2}$ tons of goods, or 300 passengers.

All the engines, the performances of which have been noticed, were constructed by Davis & Gartner, at the Company's workshops, in this city, and the fuel consumed was, and continues to be, Anthracite coal. With this fuel and these engines, it is confidently believed that greater powers have been here displayed than have been attained with the use of the locomotive engine upon any other road in Europe or America.

Upon the Liverpool and Manchester railway the locomotive engines used are of three classes, called respectively the *train*, *luggage*,

and "*bank*" engines. The train engines weigh about 8 tons, the luggage engines about 9 tons, and the bank engines, about 12 tons.

The information now stated in relation to the engines upon this celebrated road, is deried from "observations on the Liverpool and Manchester railway. By David Stevenson, Edinburgh—Read before the Society of Arts for Scotland, on the 25th February, 1835." See American Railroad Journal, vol. 4. No. 21, by D. K. Minor.

At the time these facts were collected there were but two bank engines, the "Goliah" and "Sampson," which are used in assisting the trains with passengers and luggage up the inclined planes at Whiston and Sutton, these planes are each $1\frac{1}{2}$ miles in length, and rise 1 in 96, or 55 feet per mile: the residue of the railway traversed by locomotives is either level or inclined 1 in 880, or only 6 feet per mile. The cylinders of the different engines are from 11 to 14 inches in diameter, with a stroke of from 16 to 20 inches. Coke is the fuel employed by which the expense over the use of pit coal, is increased about 40 per cent.

There are generally 8 or 10 engines at work on the line, each of which makes 4 trips a day between Liverpool and Manchester, (in all 120 miles) and on coming in at night the steam is blown off and the machinery is thoroughly cleaned, and repaired. "The luggage engines perform a great deal of work, and generally bring in 20 loaded wagons, averaging $3\frac{1}{2}$ tons each. With this load they move easily at the rate of 20 miles an hour on every part of the railway, excepting at Whiston and Sutton inclined planes, where the effect of gravity reduces their power $\frac{2}{3}$rds, and forces them to bring their load to the summit at 2 and sometimes 3 trips, although assisted by the bank engines. They nevertheless make the journey between Liverpool and Manchester, in about 2 hours. Upon one occasion I saw the "Fury" engine with 12 loaded wagons, averaging $3\frac{1}{2}$ tons each, ascend the Whiston plane without the aid of the bank engine: its speed on the level was about 30 miles per hour, and when it reached the top of the plane, the velocity was diminished to about 2 or $2\frac{1}{2}$ miles per hour." Some idea may be formed of the load these engines are capable of taking, from the fact, that, during my stay in Liverpool (says the Scotch engineer) the "Atlas" engine brought in 47 wagons, being a load of 160 tons."

The foregoing, facts in relation to the English engines are interesting, whilst the latter experiment is more especially intended to indicate the extreme performance of the luggage engine of 9 tons. That of the engine "George Washington" of $8\frac{1}{2}$ tons upon the Washington Railroad, however, is equivalent to the conveyance upon an ascent of 6 feet per mile, a train weighing gross 172 tons, at the rate of 11.48 miles per hour: the adhesion employed, that is, the traction, being 2322 lb. or 58 lb. less than the ratio of $\frac{1}{8}$, whilst the generation of steam was sufficiently rapid to employ, at the same speed, the adhesion of $\frac{1}{8}$.

The velocity of the "Atlas" engine is not given, but it is not probable that it exceeded 10 miles an hour upon the ascending parts of the

road. The "Fury" engine was not able to maintain a greater velocity than $2\frac{1}{2}$ miles per hour upon the ascent of the Whiston plane of 1 in 96, with a load of 42 tons. Here the gravity per ton is $23\frac{1}{3}$; then supposing the weight of the engine and tender to have been 14 tons, and the resistance on the level 12 lb. per ton, the power exerted by this engine will be found this:

		lb.
Gravity of load, $= 42 \times 23\frac{1}{3} =$		980
Gravity of engine and tender, $= 14 \times 23\frac{1}{3} =$		327
Friction of load, $= 42 \times 12 =$		504
Power of traction exerted, and therefore the quantity of adhesion employed, beyond the friction of engine and tender, in this ascent,	=	1811
This is a less traction than that of the engine on the Washington railroad by,	=	411
Traction of Washington engine, =		2322

The adhesion of the "Fury" engine being sufficient to ascend the plane with the given load, it follows that the velocity would depend upon the steam, and seeing that the latter was only equal to a velocity of $2\frac{1}{2}$ miles per hour, with a tractile force of 1811 lb., whilst the Washington engine with a traction of 2322 lb. maintained, for 5 consecutive miles, a speed of 11.48 miles an hour, therefore, the power of the latter to furnish steam, very much exceeds that of the former.

From the experiments that have, from time to time, been made upon the Baltimore and Ohio and the Baltimore and Washington railroads with these engines, it would appear, that the adhesion of the *one eighth* of the weight in all states of the rails, excepting only, when they are partially covered with snow, or with hoar frost; and that they are capable of generating steam sufficient to employ this adhesion when running at a speed of 10 miles per hour at the least. And although the performance here indicated is greater than has hitherto been attained elsewhere, yet, the fact being established by practical demonstration, we are authorised to avail ourselves of this one additional step in the improvement of the locomotive engine, and to apply the results to the crossing of the Alleghanies.

The following is a statement of the gross tonnage that engines of $7\frac{1}{2}$ and $8\frac{1}{2}$ tons, will respectively, draw upon a level, and likewise up certain ascending grades at the speeds of 10, 14, 17, and 20 miles per hour. The resistance on the level being 12 lb. per ton.

	tons.					tons.		
	Locomotive $= 7\frac{1}{2}$				Locomotive $= 8\frac{1}{2}$			
	Tender $= 4\frac{1}{2}$				Tender $= 5\frac{1}{2}$			
Speed.	10	14	17	20	10	14	17	20
Grades. Level.	175	120	96	80	200	136	109	90
25 ft. pr. m. $= \frac{1}{211.2}$	87	57	44	35	100	66	51	41
50 ft. pr. m. $= \frac{1}{105.6}$	54	35	26	20	63	40	30	23
75 ft. pr. m. $= \frac{1}{70.4}$	38	23	16	11	44	27	20	15
92 ft. pr. m. $= \frac{1}{57.3}$	30	17	12	8	36	21	15	10

These tabulated results have been obtained as follows, viz: and for example, take the case of the $8\frac{1}{2}$ ton engine.

	lb.
Locomotive engine, $= 8\frac{1}{2}$ tons, $=$	19,040
The adhesion employed in drawing the train exclusive of that required to impel the engine and tender, $= \frac{1}{8}$ $=$	2,380

The resistance in the level upon the Washington railway being 11 lb. per ton, therefore, the weight drawn would be $\frac{2380}{11} = 216$ tons. But as the surface of the *mountain way* may be a little more curved, or in a condition to offer rather more resistance, the traction is taken at 12 lb. per ton, and consequently the weight drawn on a level will be $\frac{2380}{12} = 200$ tons, *very nearly*, as set in the table under the speed of 10 miles an hour, although by experiment, the velocity would be 11.48 miles per hour with 211 tons, as already shown.

In addition to the friction, the engine, in ascents, has to overcome that portion of the gravity of itself and tender which is due to the inclination of the *way*, together with a similar part of the gravity of the train drawn: For example, upon the grade of 25 feet per mile, the gravitating tendency down the declination will be $\frac{2240}{211.2} = 10.6$ lb. per ton; and this for 14 tons, gives 148 lb., as the gravity of the engine and tender down this grade. A part of the adhesion equal to 148 lb., will, therefore, be employed in impelling the engine and tender against gravity, leaving off the 2380 lb., a remainder of 2232 lb. of adhesion that will be effective in drawing the train, the resistance of which is 12 lb. per ton for friction, and 10.6 per ton for gravity; being together 22.6 lb. Therefore, $\frac{2232}{22.6} =$ 100 tons to be conveyed up the ascent of 25 feet per mile at 10 miles per hour, as in the foregoing statement.

To estimate the effects at different velocities, the friction or resistance of the engine and tender of 12 tons upon a level, is assumed at 200 lb, and that of the 8½ ton engine and its tender of 5½ tons, at 233 lb. Adding then, 233 to 2380, we obtain 2613 lb. as the actual adhesion employed in drawing the entire train on a level. Then it will be, inversely, 14 : 10 : : 2613 : 1867 lb, the part of the adhesion that is used in impelling the entire train, when the load is adjusted, so that the power of the steam will maintain a speed of 14 miles an hour. But the quantity here deduced includes the adhesion that balances the friction of the engine and tender, viz: 233 lb. Therefore, deducting this from 1867, there remains 1634 lb. of adhesion being the quantity consumed in drawing the cars at a speed of 14 miles an hour.

Upon the level, where the resistance is 12 lb. per ton, the gross tonnage drawn at this speed will therefore be $\frac{1636}{12} = 136$ tons, as set down under the proper head in the table.

Lastly; upon the grade of 25 feet per mile, the gravity of the engine and tender is 148 lb. as has been shown; deducting this from 1636, there is obtained 1486 lb. as the adhesive or tractile force employed in drawing the cars up the ascent of 25 feet per mile, at a speed of 14 miles per hour: and as the resistance they here offer 22.6 lb. per ton, the tonnage drawn will be $\frac{1486}{22.6} = 66$ tons, as in the foregoing statement. In the same manner have all the other results been deduced.

Considering the line from Cumberland to the Ohio River, at Wheeling, as it has been traced from reconnoissance, with a view to a proper adaptation of the motive power to the system of graduation as we have stated it, and of which the intervening country is susceptible, it seems very clear that an engine employed in the conveyance of merchandize or any articles of trade, should not be loaded beyond its tractile power upon an inclination of 25 feet to the mile at a speed of ten miles per hour: For with such a load the engine could travel three fourths of the entire distance, or 140 of the 182 miles, at the speed proposed. The load mentioned would be just about one half the maximum load upon a level, and consequently with the former, the engine would travel over all the grades of a less ascent than 25 feet per mile, with a surplus power, that would enable it to start easily from a state of rest, after it should at any time be necessary to come to a stop; and to travel, when the adhesion upon the rails should be lessened from the presence of mud, frost, or snow, or when from any cause the resistance to the progressive motion of the train should be increased.

Economy of arrangement having settled this point, it follows that all grades above 25 feet per mile must necessarily be passed at a loss of useful effect, and at an increased expense of transit. Admitting, therefore the engines to have their appropriate loads upon the grades of 25 feet per mile and less, and we cannot admit the contrary to much extent in the conveyance of commodities, it results as a consequence, that these loads must be impelled up the grades steeper than 25 feet per mile, either by engines of a higher class; that is, heavier and of more tractile power than those employed upon the leveller parts of the line, or by means of assistant engines, in aid of those that shall arrive at the foot of the steeper grade with the trains; or, perhaps, in some cases, by both expedients, or by dividing the train. It is highly important then to the cheapness of transit, that the higher grades, if any, should be few and short, and, that they should be admitted at as few places as may be practicable, having regard to other important considerations.

Between Cumberland and Wheeling we find the higher grades must be admitted upon three distinct and distant parts of the line, viz. at the crossing of the summit between the eastern and western waters; at the summit between the Youghiogheny and Monongahela rivers; and at that between the latter river and the Ohio. The first extends from Cumberland to Casselman's river, at a point about four miles below the mouth of Flaugherty creek, a distance of 32 miles, if grades of 92 feet per mile and a tunnel through Savage mountain be adopted; but if the proposed route with grades of only 50 feet per mile, and without a tunnel be chosen, then the distance will be increased 13 miles, and will be 45 miles to the point on Casselman's river. At the same time, and in either case, there will be 5 miles of the distance upon Flaugherty creek, upon which the grade will be less than 25 feet per mile. We may therefore consider this distance of 32 (or 45) miles as of the higher grades, or it may be separated into an eastern and a western portion; the eastern extending from Cumberland to the summit, 20 miles, upon which there is 16½ miles at a grade of 92 feet to the mile, 2 miles at 51, and 1½ miles at 40 feet to the mile; or otherwise the summit will be reached in 33 miles, with a uniform and constant grade of 50 feet to the mile: whilst the western portion of the higher grade will, in either case, consist of 7 miles at a uniform descent westwardly to Casselman river, of 50 feet per mile.

The second summit, or that between the Youghiogheny and Monongahela, is passsed with 7 consecutive miles of grade at 45 and 50 feet per mile; that is, 3 miles going westwardly, and 4 eastwardly of the summit: Whilst the third and last summit, or

that between the Monongahela and Ohio rivers, is passed with 8.69 miles of the higher grade, viz. east of the summit $3\frac{1}{4}$ miles at about 65 feet per mile, and west of the summit 2.44 miles at 75 feet per mile, and 3 miles at 34 feet per mile: the ascending and descending grades being separated only by a distance of 330 feet upon the summit which has been assumed as level.

To facilitate the management of the transportation, the route must be laid off in divisions, each having its allotment of engines and men, with their assigned day's work; and, in a word, each having its appropriate system of operations. The divisions may be as follows: viz.

	Miles.
The *Cumberland* division, extending from Cumberland to Casselman's river, by the short route and tunnel.	32
The *Brownsville* division, extending from thence to the Monongahela river.	80
The *Wheeling* division, extending thence to Wheeling.	70
	182

Following out this arrangement, the branch to the city of Pittsburgh, would constitute the *Pittsburgh* division of 50 miles in length.

In this arrangement of the divisions, the engine should probably pass three times over the Cumberland division in each day, being 96 miles in 12 hours; once over the Brownsville division in a day, or 80 miles in 10 hours; and once over the Wheeling division in a day, or 70 miles in 9 hours.

The train, according to the principle recognised, would consist of as many cars as the engine would draw at a speed of 10 miles an hour up an ascent of 25 feet per mile; and assuming the employment of the engine of $7\frac{1}{2}$ tons, the load exclusive of the weight of engine and tender, will be 87 tons gross, that is, including freight and cars, both empty and laden; and it might consist of 1 empty car, and 20 cars having 60 tons of freight; 4 empty cars, and 19 cars with 57 tons of freight; 8 empty cars and 18 cars with 54 tons of freight; 11 empty cars, and 17 cars with 51 tons of goods; or 15 empty cars with 16 cars carrying 48 tons of goods. Assuming that from the inequality of trade in the opposite directions about one third part of the number of cars in transitu will be empty, it follows that the useful effect of the engine will consist in the transit of from 50 to 55 tons of commodities in the train of 87 tons gross.

The $7\frac{1}{2}$ ton engine would convey at the same speed (10 miles an hour) 30 tons gross up the ascent of 92 feet per mile, or 7

cars with 21 tons of freight; and allowing for the transit of empty cars, its load up this ascent would be 6 cars with 18 tons of goods together with three or four empty cars attached. Two additional 7½ tons engines would therefore be required upon the grade in question, in order to transport the same quantity of goods in the same time *there*, that one engine will be competent to convey upon grades not exceeding 25 feet of ascent in the mile. We cannot recommend that a greater weight than two tons should be allowed to rest upon the rail through one wheel. or that the weight of a locomotive engine upon four wheels, should exceed 8 tons : and as the 7½ ton engine appears to be sufficiently powerful for the usual purposes of transit, and would most probably be employed upon all those parts of the line where the use of those of the higher classes will not be needful or expedient; it is possible that heavier engines than those of 7½ tons may be dispensed with upon the higher grades than 25 feet per mile. However, should engines of 6 or 8 wheels be so contrived as to work in curves with the adhesion of all the wheels; or should it be practicable to lay the line of the road so straight in steeper grades, that no difficulty would be experienced in connecting so many wheels, it might then be advantageous to employ engines of 10 or 12 tons weight upon the grade of 92 feet to the mile : and that such engines will yet be made, we confidently anticipate: meanwhile all the transit can be effected with the 7 or 8 ton engine.

At the summit ridge between the Dunbar and Redstone creeks, that is, between the Youghiogheny and Monongahela rivers upon the Brownsville division, where, upon one side of the summit there are 3, and upon the other side 4 miles, of grade at 50 feet to the mile; the Engine will have time to pause and spend an hour in the conveyance of its train of 87 tons up the ascent by means of two trips: Going westward, the Engine will run into a siding at Dunbar creek near the foot of the ascending grade of 50 ft. per mile, where it will disengage one half the train and with the half remaining attached, pass to the summit, 3 miles where, leaving, likewise in a siding, this portion of the train, it will return empty for the other portion, which being likewise conveyed to the summit, the entire train with 87 tons will then proceed upon the journey through the remainder of the division to the Monongahela; whilst the time consumed in the day's work inclusive of the hour thus spent at the summit, will be only 1 hours. In precisely the same manner, and within a quarter of an hour of the same time will the same summit be passed with the same Engine and an equal load, in passing eastwardly.

After the manner just explained the summit upon the Wheeling division separating Ten mile and Wheeling creeks will be passed with a $7\frac{1}{2}$ ton Engine, and its train of 87 tons, with the employment of an hour extra, westwardly, and of 2 hours, extra, eastwardly: So that the time consumed in passing from Brownsville to Wheeling would be 10 hours, and from Wheeling to Brownsville, 11 hours, as the day's work in the transportation of commodities. Upon the western side of this summit where the grade as contemplated in the preceding pages, is to be 75 feet per mile, the $7\frac{1}{2}$ ton Engine will not, it is true, convey up at two trips, the 87 tons: it would only convey 38 tons per trip, or 76 tons in the two trips. To obviate the evil that would result from this, let the grade be reduced to that of 66 feet per mile, as with some additional expense could readily be done, and then the Engine would convey at once, 44 tons, and therefore at twice, the 87 tons, up the ascent. And here permit us to remark how proper it is in establishing the grades and curvatures of a railway in a hilly or mountain country to consider well the relative efficiency of the motive power upon the several parts of the same: Here, previous to applying the results of calculation, relative to the performance of the Engines, we had introduced a grade of 75 feet per mile through a distance of $2\frac{44}{100}$ miles; and by this step it would have required three trips of the Engine to convey up the ascent the same load with which it had arrived at the foot of the steeper inclination: Whereas, by lessening the rate of ascent to that of 66 feet per mile, being only 22 ft. in the entire length of the grade, the Engine will be enabled to perform the service at only *two* trips. Very slight modifications therefore in the grades or curvatures, may, in the consequent changes in the resistances to be overcome, cause great variations in the cost of transit, and in some cases may even involve a very different arrangement of the motive power.

With regard to the relative expense of transit upon these several divisions of the road, we may offer a few remarks.—In my report upon the probable cost, &c. of the Washington Railroad, it was estimated that the daily cost of a locomotive engine and tender running 80 miles, would be $21.02, (see 7th Ann. Rep. p. 116,) and that the cost of cars would be 48 cents 7 mills per day each, or about $\frac{1}{5}$ of a cent per ton per mile. The fuel from Cumberland to Wheeling will be the coke of the bituminous coal with which that whole region of country abounds. It is probable that the fuel there will cost considerably less than $10.50 for 80 miles, as was estimated in the report aforesaid: at the same time, the engines proposed to be employed will be heavier and rather more costly

than those then estimated for: moreover the Railway across the mountains may, in consequence of more curvature, as well as of more unevenness of surface and of grade, induce a greater wear and tear of the machinery to be employed upon it: and this may somewhat exceed in amount the difference between the cost of fuel and the estimate of that article above mentioned: assuming then, the locomotive engine expenses at $25 for 80 miles; then the conveyance of 18 tons of goods in the train upon the Cumberland division will cost $\frac{2500}{1440} = 1\frac{74}{100}$ cents per ton per mile, whilst upon the parts of the line not exceeding 25 feet per mile in grade, and where the goods in the train will be 51 tons, the cost per ton per mile will be $\frac{61}{100}$ of a cent. The latter power will be increased on the other two divisions of the road on account of the delay and additional work at the summits, as already described. Upon the Brownsville division the virtual distance, or actual travelling of the engine is increased, say 8 miles, being 10 per cent; whilst upon the Wheeling division the increase will average about 9 miles, or 13 per cent of the distance. Correcting for these, the locomotive engine expenses per ton per mile upon these two divisions may be estimated at $\frac{67}{100}$ and $\frac{69}{100}$ of a cent, respectively. Adding for the car expenses, $\frac{25}{100}$, we obtain the probable rate of expense of conveying goods upon the three divisions, viz:

	Cents.
Upon the Cumberland division, per ton per mile,	1.99
Do Brownsville do per do do	0.92
Do Wheeling do per do do	0.94

Being an average upon the entire distance of 182 miles of $1\frac{115}{1000}$ cents per ton per mile. To these rates must be added sufficient to cover the pay of superintendents and agents connected with that part of the motive power employed in the transportation of commodities, office expenses, contingencies, and tolls.

The rate of tolls that shall yield a remuneration for the outlay in the construction of the road, and in all that shall be appurtenant to it, will altogether depend upon the quantity of transportation and travel to pass in a given time. We do not at present touch upon this subject, but shall leave it to the contemplation of those who may be pleased to make the estimate, our business being more particularly to determine whether physically, a practicable route for a Railroad, and if possible, for one upon which locomotive engines

can be worked to the entire exclusion of fixed or stationary engines, can be found that shall extend from Cumberland across the Allegheny mountains to the Ohio: at the same time we are of opinion that the tonnage and travel upon such a railway would be very great.

Before dismissing this branch of the subject we may remark that in case the route is adopted from Cumberland to the summit of the mountain upon which the grade may probably be reduced to a uniform inclination of 50 feet to the mile as the maximum, still the points of division into three parts may remain the same as before given, and the Cumberland division, elongated 13 miles in order to lessen the rate of ascent, will then be 45 miles in length; whilst the entire distance to Wheeling would be increased to 195 miles. Two locomotive engines would then convey up the mountain grade the train of 87 tons gross: And from a calculation already employed, it appears, that two 7½ ton engines would do this even upon a rise of 66 feet per mile. It would seem to follow from this fact that the grade might almost as well reach 66 as 50 feet per mile: but it must be observed, that unless such increase of grade should be attended with some considerable diminution of the distance, or of the expense of construction, it would not be expedieut to approach so near to the full power of the engines upon a part of the line reaching to an altitude of 1650 feet above the level of the town of Cumberland, and 2278 feet above that of the ocean; and therefore subject to the sleets and snows of this elevated region.

In justice to the subject we may likewise further observe that instead of continuing the Cumberland division to Casselman's river, it might terminate at the summit of the mountain, in case the length would be 20 miles, if the route with a tunnel and 92 feet grades should be adopted; or it would be 33 miles in the event of taking the route around the Savage mountain, avoiding a tunnel, and reducing a grade to 50 feet per mile. In this arrangement the Brownsville division might be limited to the 22 miles extending from the western base of Laurel hill at Dunbar creek to the western bank of the Monongahela, whilst a new division would be introduced to be called the *mountain* division, 70 miles in length, and extending from the summit of the mountain to Dunbar creek: thus:

			miles.
The Cumberland division would be,			20
The mountain	do.	do.	70
The Brownsville	do.	do.	22
The Wheeling	do.	do.	70
			182

The mode of operation would then probably be, that the three engines engaged upon the Cumberland division, (to do the work of one engine where the grades did not exceed 25 feet per mile) would each make two circular trips, that is, would travel daily,

80 miles. The engine upon the *mountain* division would pass over it 70 miles in the day, 7 miles of which, passing the mouth of Flaugherty creek, would necessarily be traversed with half the train at a time as already described for other grades of 50 feet per mile. This extra work would be performed only when the engine travelled eastwardly. To balance this necessity, so as to render the work more equal in each direction, the engine on arriving from the East at its station upon the Dunbar level, should be made to continue on with one half of its train to the summit east of Redstone creek, 3 miles distant from the station, where it should leave the Cars in a siding ready for that engine whose business it would be to bring up the other half of the train, and then with the whole 87 tons proceed to the station at the Monongahela: or, if the latter engine should be at the Dunbar station when the other should arrive from the mountains, both engines could proceed together over the 3 miles to the summit at Mount Braddock, from whence the engine of the mountain division would immediately return to its station at the Dunbar, whilst that of the Brownsville division would advance to the Monongahela.

The engine upon the Brownsville division would make two circular trips, travelling 104 miles in a day of 13 hours. That is, it would travel from the Monongahela to Dunbar, 22 miles, and in so doing would pass the 4 miles of 50 feet grade ascending from Redstone creek to Mount Braddock with half the train at a time, thus travelling 8 miles additional, making 30 miles. Upon the return, being assisted to the summit, the distance travelled would be 22 miles; and the circular trip, 52 miles; or 104 miles for the day's work; which, by increasing the speed to 9 miles would be performed in 12 hours. The Wheeling division would be traversed as before explained.

It is deemed unnecessary at present, to speak of the application of the motive power upon any other route, or to compare the two proposed systems of division upon the route described, as either would be practicable, and the proper time to arrange such details would seem to be when the road shall have to be definitively located.

Having said thus much with regard to the transportation of commodities, it may be proper, before leaving the subject of motive power, to advert to the conveyance of passengers.

In this department the same divisions of the line as for the transit of goods will not be necessary, seeing that the speed must be greater with passengers; nevertheless the more numerous stations established to further the operations of the engines with their trains of freight cars, may likewise facilitate the running of those employed in the conveyance of passengers and the mails, inasmuch as it will be at these stations, (and perhaps at some other points) that spare engines and tenders will be in store to

be employed in case of need, and it is at these stations likewise that ordinary repairs may be made.

Supposing the rate of speed to be 14 miles per hour, the 112 miles of distance between Cumberland and the Monongahela at Brownsville will be travelled in 8 hours; and the 70 miles thence to Wheeling, in 5 hours: The rate of travelling between Brownsville and Pittsburgh, on account of the more gentle curvatures, may be at the rate of 17 miles an hour, and the 50 miles of distance along the Monongahela between those two towns would be passed over in 3 hours. Consequently the time employed by the locomotive engine and its train of passengers coaches, in passing the 182 miles of distance between Cumberland and Wheeling, would be 13 hours, and the average rate of speed 14 miles per hour. In passing the 162 miles between Cumberland and the city of Pittsburgh the time would be 11 hours at an average of $14\frac{3}{4}$ miles an hour—and in traversing the 120 miles between the cities of Pittsburgh and Wheeling the time would be 8 hours, and the rate of speed 15 miles an hour upon an average.

The speed here assigned will therefore carry the passengers from Cumberland to the Ohio River during the day light of a single day: And when the Railroad shall be completed from the city of Baltimore to Cumberland, this portion of the line will likewise be travelled in an equal space of time at the rate of 16 or 17 miles an hour: consequently the entire distance from Baltimore to the Ohio river will be passed in 24 hours travel; and that without exceeding the rate of speed already attained upon this road as well as on several other lines of railway in this country, where the locomotive steam engine is employed.

The $7\frac{1}{2}$ ton engine will convey up an ascent of 92 feet per mile at a speed of 10 miles an hour, a train containing 150 passengers, and at 14 miles an hour 85 passengers. Upon an ascent of 66 feet per mile, the same engine would convey at the rate of 10 miles an hour 220 passengers, and 100 passengers at a speed of 17 miles an hour: When the grade ascends at the rate of 50 feet per mile the train conveyed at 10 miles an hour would be 270 passengers; at 14 miles, 175; at 17 miles 130; and at 20 miles an hour 100 passengers: whilst up ascents of 25 feet per mile, there would be drawn at 10 miles 435; at 14 miles 285; at 17 miles 220; and at 20 miles an hour 175 passengers. No doubt remains therefore, of the practicability of constructing a railroad across the Alleghanies upon which the motive power employed should be that of steam with locomotive engines, by which fixed or stationary engines with their ropes, and other machinery incident to inclined planes, might be wholly dispensed with.

The probable expense of construction.

Under this head it is impossible, on account of the want of the

necessary data, to arrive with certainty at any definite or precise conclusion; all that we can offer, is, an approximate estimate, founded partly upon mere conjecture, and partly upon a hasty reconnoissance. Instrumental measurements have not been had that would at all assist in ascertaining the probable expense of constructing a railroad in the direction proposed. Regarding the distances and altitudes, however, sufficient data to form approximate conclusions have been furnished by the surveys and levellings made with a view to certain public works, and especially to that of the Cumberland road, the improvement of the navigation of the Monongahela, and to that noble work, the Chesapeake and Ohio Canal.

The mountain slopes likely to be occupied by the line of the road from near Cumberland to the summit separating the eastern and western waters, could not, without actual levelling for that purpose, be designated, with sufficient exactitude, to permit of an estimate being made with any certainty. No doubt, however, this part of the line will be quite expensive, owing to the necessary rigidity of the grade, and the circumstance of being compelled to traverse, for many miles together, the mountain slopes which are often precipitous and rocky. Possibly, nevertheless, the graduation, bridging, and railway with two tracks, with the common plate rail laid upon the timber afforded by the neighboring forests, would not cost more than 25 or 30 thousand dollars a mile for the 33 miles from Cumberland to the summit at Albright's farm, which distance is set down at a uniform grade of 50 feet per mile. If the shorter route with a tunnel of half a mile in length through Savage mountain be adopted, the distance between Cumberland and Albright's would be 20 miles: in the former case, the cost of construction at $30,000, would be $990,000; and if the 19½ miles upon the latter, exclusive of the tunnel, should cost $30,000 per mile, there will remain, to render the two routes equally expensive, $405,000 for the cost of the half mile tunnel passing 300 feet below the apex of the mountain. As it is not probable that the tunnel would cost so much as this, the presumption is, that the shorter route will be constructed at a less expense than the longer one: we shall however cease to speculate in a case where, as yet, we know so few particular facts upon which to base the estimates, and proceed to the mountain division of 70 miles. This portion of the line extends 5 miles down the valley of Flaugherty creek to the Alleghany mountain, a distance that will be very easy of graduation. Thence 3 miles through the rugged pass of this mountain, where the line will lie upon the rocky slope of the gap through which this creek passes to its confluence with the Casselmans river; thence 4 miles, and crossing that river to its left bank above the mouth of the Bluelick and below that of the Elklick creeks. These 7 miles will be somewhat costly from the ruggedness of the mountain pass, and from the necessity of a bridge across the Casselmans river of about 200 feet span: from thence to Turkeyfoot, a distance of 31½ miles, the line will

pursue the left bank of Casselmans river to its junction with the Youghiogheny, which latter river it will there cross upon a viaduct of about 300 feet span. In this distance the route will have passed the gaps of Negro mountain and of Winding ridge, but it is believed, judging from the canal surveys and estimates upon the opposite side of the stream, and from the appearances along other streams in these mountains, (for this part of the route was not personally examined, the practicability being taken for granted from the canal survey and levels,) that no very great or unusual expense will be incurred. From Turkeyfoot to the western base of the most western mountain called Laurel hill on the left side of the Youghioghe-ny, but Chestnut ridge upon the right side of that stream, the route will pursue the left bank of this river, a distance of 26½ miles. At the distance of between 9 and 10 miles below Turkey foot commence the cataract called the Ohiopile falls, where the river in the distance of a few yards descends 32 feet, the lower half of which is by means of a perpendicular pitch. The rapids continue for a considerable distance below the cataract, and are such that in the distance of a mile, (by the canal survey upon the right bank,) the stream descends 96 feet. Though the scenery here is wild and imposing, yet the shore is not so rugged but that the railroad can be readily formed; and there is room likewise, for the placing of milling and manufacturing establishments, for the propelling of which the river is here admirably well situated and adapted. The stream here makes a sudden and great bend to the right, upon the convex side of which the graduation of the railroad will be readily effected, it is believed, at a grade not exceeding 25 feet in the mile; an opinion formed from an actual inspection of the ground for several miles along the river. There are portions of ground for several miles together, occasionally found along the slopes bordering on this stream that are very easy of graduation for a road bed for two tracks of railway, although the surface, from the presence of nothing but loose rock, presents a very rugged appearance. In such places as these the removal of the rocks will be effected at little cost, whilst the graduation will need no repairs afterwards. At other places, the ground becomes steeper than could be desired, and the expense will consequently become enhanced. Upon the whole, however, and considering the abundance and cheapness of sand-stone rock suitable for masonry, we should not expect this mountain division of 70 miles to cost, with a double track, more than $20,000 per mile, upon an average.

The Brownsville division, extending from the western base of Laurel Hill to, and across, the Monongahela river, 22 miles, passes through a thickly populated and well cultivated country. The soil is of excellent quality, abounding in lime-stone and sand-stone, the latter being of a good quality for building where great strength is not required, as for instance, they will answer well for stone bridges where the arch is of a span not greater than 40 or 50 feet. This

division will cross the Dunbar creek of 40 or 50 feet span; then it will pass up Guest's run to the summit at mount Braddock, or General Mason's farm, when, after an excavation of 30 feet in depth, and of moderate length, it will descend by Lick run, or else by Rankin's run (unless indeed some better route shall not be found,) to Redstone creek, 7 miles from Dunbar: thence the line will descend the creek, 15 miles to its mouth at the Monongahela, which river will here be crossed upon a viaduct of stone abutments and piers and wooden superstructure, and 650 feet in length: the river rises in extreme freshets 40 feet perpendicular, and the viaduct must be at least 50 feet above the level of low water. The valley or rather ravine of Redstone creek is very crooked and narrow, being confined between steep hills of rich soil, rising from 200 to 300 feet above the level of the stream, at an angle of from 10, 15, 20, or even 30, and sometimes 40 degrees. In order to lessen the length of the line, and at the same time to lengthen the radius of curvature, it will be found expedient sometimes, though rarely, to divert the course of the stream in the bottom lands; but oftener to bridge it. Cases will arise where, considering the cost of graduation and of the two tracks of railway, it will be cheaper to bridge the stream than to meander its course; and from these causes, some half a dozen bridges may be required across this creek in the 15 miles of distance. The graduation will not be expensive. The cost upon this part of the line, exclusive of the viaduct over the river, will probably not exceed $15,000 per mile.

The cost of the Wheeling division may likewise be about $15,000 per mile; although the expense of the bridges upon Ten Mile and Wheeling creeks will be very considerable.—Materials of good quality for construction likewise abound upon this division. Several necks of land in the bends of these creeks, and especially in those of the latter near Wheeling, must be cut through, and these excavations in some instances will add to the expense of what would accrue upon the more circuitous route, whilst in others the effect will be the reverse: In general however, the line will run upon ground that will afford a cheap graduation; and no fear need be apprehended from land-slips. The estimates here offered, it must be borne in mind, are nevertheless, but approximate; and as such only are they given. They country from Brownsville to Wheeling is very similar, in many respects to that between the Mountain and the Monongahela. The exceptions will chiefly be, that the land west of this river is of a rather richer quality, and it is most so in the vicinity of the rivers, but especially near the Ohio. Though the country is well settled upon Wheeling creek, yet the population is not so dense as upon Ten Mile or Redstone creeks, where it is at least 50 to the square mile.

The Pittsburgh Route.

From Brownsville to Pittsburgh, the distance along the river shore is 55 miles, as measured by the Pennsylvania State Commissioners, Henry P. Pearson and John Crawford, and more recently by Dr. Wm. Howard, for the United States. In passing along the entire distance, it is abundantly obvious that a shorter line will be had for a railroad than that presented by the river shore: along the narrows, so called, because the river at these places lies at the base of the hill or so near to it that no room for cultivation intervenes, there will be ample space for the railroad; and in these places, which are several in number, though not of very great extent, the line of the road will have about the same length as that of the river shore parallel to it. In the much greater part of the way, however, the line may be laid some distance from the river bank and between the bottom lands and the hill, or upon the base of the latter, and the length of the line will consequently be less than that of the corresponding part of the river. At the Horse-shoe bend and at the curve a short distance below the confluence of the Youghiogheny, much distance may be gained upon the river measurement. Finally, no doubt remains but that the distance from the mouth of Redstone creek, (1 mile below Brownsville) to Pittsburgh, will be reduced to within 50 miles. The entire route of the Pittsburgh division is very favorable for a cheap construction. It will be necessary to erect several bridges across lateral streams, and a viaduct across either the Youghiogheny or the Monongahela, according to the side of the Monongahela adopted; but the forming of the road bed will be cheaply effected. Fifteen thousand dollars a mile for the graduation, masonry, and two tracks of railway, (exclusive of a viaduct across the river,) is considered a high estimate for this division; but as the same sum may be low for the Wheeling division, we shall not reduce the amount in this instance. The entire distance along the Monongahela exhibits the most indubitable proofs of the presence of the greatest abundance of bituminous coal, of the most easy access, and of as fine quality as any in the world; the country is likewise highly cultivated and densely populated, whilst the three great divisions of industry, Agriculture, Manufactures, and Commerce, are mutually flourishing.

Recapitulation.

Miles.		*Dollars.*
20 at $49,500, or 33 miles at $30,000 per mile,	=	990,000
70 at $20,000, extending to the western base of Laurel hill, ...	=	1,400,000

22 at $15,000, or including a viaduct over the Monongahela, estimated at $50,000, $17,273 per mile, ...		380,000
Total to west bank of the Monongahela,	=	$2,770,000
70 at $15,000 per mile, ...	=	1,050,000
Total to Wheeling on the Ohio river,	=	$3,820,000
50 from 1 mile below Brownsville to Pittsburgh, at $15,000 per mile, but including a viaduct over the river estimated at $100,000, $17,000, ...		850,000
232 miles, at $20,129 per mile, . . .	=	$4,670,000

Some further observations in relation to the Branch Railroad to lead from the main stem to the City of Pittsburgh.

Expediency being consulted, we have deemed it advisable to take it for granted that the main stem of the Baltimore and Ohio Railroad in its extension to the Ohio, will be made to intersect that river at some point considerably lower down the stream than Pittsburgh: say, for example, at Wheeling. The State of Pennsylvania, always magnanimous and liberal touching the trade and intercourse of other states as well as just with regard to the interests of her own people, in the exercise of her sovereign will, in granting to the Baltimore and Ohio Railroad Company the necessary privileges, powers, and immunities to locate, construct, maintain, and enjoy a continuance of their Railroad upon, and through said state, in a direction towards the Ohio river, did not compel the Company to terminate that work at the great Western Emporium of the commonwealth, *the City of Pittsburgh* as, in the plenitude of her power, she might have done. On the contrary, in the same enlightened intelligence that she has at all times exercised, and which is so well set forth in the preamble to her act of assent, as well as substantially in the act itself, her legislation contemplated the possible intersection of the Ohio river at some point lower down the stream, by which means the entire public might be more highly benefitted than if the terminus were at Pittsburgh; at the same time, in justice to that city and the western portion of the state, the act was made to provide, that if the contemplated Railroad should not terminate at the Ohio river in the vicinity of Pittsburgh, the Company should "construct a lateral railroad, simultaneously, on the same principles and plans of the main Railroad, and which shall connect the city of Pittsburgh with the main Railroad."

The termination of the main stem at a point so far down the

river as Wheeling, will enable the trade and intercourse of the central and southern of the western country to use the Railroad without navigating the 96 miles of river between Wheeling and Pittsburgh, which is sometimes too low in summer, and in winter is mostly frozen. This termination will likewise at all times accommodate a considerable extent of trade, and travel adjacent to it and west of the Monongahela, and even west of the Ohio river with a cheaper, speedier, and better route to and from the seaboard, than would the road if it terminated at Pittsburgh exclusively. Moreover, a Railroad to Wheeling would in a direct and proper course to be continued westwardly to the Ohio canal, and to the central parts of Ohio, Indiana, Illinois and Missouri; as well as more southerly to Kentucky and west Tennessee. The branch to Pittsburgh would be equally necessary and important, as accommodating a portion of the immense trade and intercourse that will concentrate at, and diverge from, that great and rising emporium; and besides it would be a continuation of the Railroad so far in a direction to the lake country.

Furthermore, it is considered highly probable that the branch should pursue the route of the Monongahela, and unite with the main railroad at that river, as already herein before mentioned. This plan will leave the Youghiogheny valley beyond the mountains, and the right bank of the Monongahela below McKeesport, free for the occupancy of the Chesapeake and Ohio canal; it will also involve the construction and maintainance of 10 miles less of Railroad; for if the branch intersected at Connelsville, it would be 60 miles long, instead of 50, when the junction is near Brownsville; the length of the main stem being the same in each case. The intersection being in the valley of the Monongahela, the branch will form with the part of the main Railroad west that river, a continuous railroad in a good direction, between Pittsburgh and Wheeling, 120 miles in length, and only 24 miles longer than the Ohio river, between the same points; thus enabling Pittsburgh and Wheeling to share in all the advantages of a direct Railroad between them in times of low water, and of ice, and indeed at all times; for the route by railway from Wheeling to Pittsburgh would be travelled by the aid of steam, in half the time that the route up the Ohio river could by means of the same powerful agent.

The probability therefore is that the two portions of theRailroad connecting the cities of Pittsburgh and Wheeling, and uniting upon the Monongahela, if indeed they will not be more profitable in point of revenue, will be equally so with the portion of the main stem between that river and Cumberland.

Of the route by the South fork of Ten mile creek.

This route will be coincident with the one already described, for nearly 13 miles westward from the mouth of Redstone creek, viz: to a point near the forks of Ten mile creek at Clarkesville, where this route departs to the left of the former, and immediately crosses the north fork of the creek, a short distance above the junction of the two, and enters the village of Clarkesville. From this place the route lies up the ravine and valley of the South fork of Ten mile creek, past the village of Jefferson to Waynesburgh, the county town of Green county, Pennsylvania, distant from Clarkesville 13 miles, by the route of the Railroad. In this distance the valley has probably risen 169 feet, or at the average rate of 13 feet per mile; It is very much curved, and will involve several expensive bridges across the stream, and some deep cuts through narrow necks of land, especially near Jefferson, whilst in one or two places it would be expedient to divert the creek from its present channel. These works would be rendered necessary to avoid curvatures of too sudden a character for a Railroad.

Thence meandering a much more favorable part of the valley for the work proposed, 11½ miles, ascending 93 feet, at the rate of only 8 feet per mile, to the junction of Gray's and Roberts' branches, and where the Grave creek route, as also examined, with a view to the Railroad, intersects. Thence up Gray's branch upon ground remarkably favorable for the object in question, 3 miles ascending at 15 feet per mile, and one mile ascending 17 feet to Gray's, thence one mile further ascending 28 feet upon ground very fair for the graduation of a road. We have here arrived near a school house, at the eastern base of the abrupt ascent of the ridge dividing the Ten mile and Wheeling waters, at Braddock's farm. Thence ¼ of a mile, to the natural summit, with an ascent of 90 feet, and thence ¼ of a mile and a descent of 110 feet to the head of Owen's run, a branch of Wheeling creek. This natural summit must be reduced by excavation, on account of the rapid descent of Owen's run, 87 feet; and then the grades from the school house will be ¼ of a mile ascending at the rate of 12 feet per mile to the summit, after a cut is made of 87 feet in depth, thence descending at *one degree*, or at the rate of 92 feet per mile, ¼ of a mile to the natural surface of the ground at the western termination of the summit excavation. Thence passing down Owen's run 2½ miles, descending 230 feet at the rate of 92 feet to the mile, to its mouth at Ackley's, and intersecting with the route as examined by the North fork of Ten mile to Wheeling. At this point of

intersection, the distance from the Monongahela at the mouth of Redstone creek, by the route of the South fork of Ten mile creek, as just now described, was estimated at 45 miles; whilst the route by the North fork of Ten mile, between the same terminations, was estimated at 44¾ miles. The difference in length, *by estimation*, being only one quarter of a mile, renders it uncertain which route, upon an exact survey with instruments, would have the advantage in point of distance.

The expense of construction by the route of the South fork would perhaps somewhat exceed that by the north fork; but the excess would not be great. Some of the curves upon the south fork are rather sudden, and might, in some instances, have to be laid at the radius of 400 feet.

The summit at Braddock's by the route of the south fork is estimated to be lower than that near Ephraim Post's, by the north fork, by 27 feet; the former being, by estimation 1177 feet, and the latter 1204 feet above the ocean level. At the same time, the excavation is greater and the grade steeper at Braddock's ridge than at that near Post's: Either however, will afford a practicable pass with locomotive steam power.

Of the route to the Ohio river at the Flats of Grave Creek.

A reconnoissance of this route was commenced on the left bank of the Ohio river, a short distance above the mouth of Big Grave Creek, at the village of Moundsville: Thence ½ a mile to the village of Elizabethtown; and thence to Big Grave creek, and passing up the ravine of the same, 2½ miles to Jones's, at the head of the backwater of the highest known freshets of the Ohio river, and about 50 feet above the level of low water mark at the mouth of Grave creek. Thence 1 mile, and ascend 45 feet, thence 1½ miles to Gregg's point, ascending 60 feet at 40 feet per mile; thence to Shepherd's 3½ miles, ascending 100 feet at 28½ feet per mile; thence to Potter's mill 5½ miles, ascending 125 feet at 23 feet per mile. The route for 3 of the latter 5½ miles passes through "the Narrows" where the creek lies in a deep and crooked ravine, with the hills rising precipitously from the water's edge upon both sides of the stream: In this pass the graduation would be quite expensive, whilst curvatures of 400 feet radius must be introduced. Thence to the junction of Haines' and Coes' forks, 2½ miles ascending 50 feet at 20 feet per mile; thence up the latter to Burley's, 3 miles ascending 60 feet at 20 feet per mile; thence up Buler's or the north fork 1⅜ miles, ascending 90 feet at 65½ feet per mile to the head of the ravine; and ⅛ mile ascending 70 feet to the natural summit of the

ridge dividing the waters of Grave creek from those of Wheeling creek. The distance upon the route now described from the Ohio river to this point is estimated at 21½ miles; and the rise is estimated at 600 feet above the level of high water mark at that river.

From this summit the route will immediately descend the ridge to Holden's run, a tributary of the South branch of the Duncard fork of Wheeling creek, as follows: viz: ⅛ mile descending 80 feet into the head of the ravine of said run, thence down the same, ⅛ mile descending 30 feet, and ⅛ mile descending 20 feet to Emory's, at the state line; thence in the state of Pennsylvania, ⅛ mile descending 20 feet; and 1 mile descending 90 feet to Barney's: Here a run having a deep and narrow ravine puts into Holden's run from the north: thence 1 mile descending 70 feet to the South branch of the Duncard fork of Wheeling creek—thence passing down upon the west or left side of the same 1½ miles descending 30 feet at the rate of 20 feet per mile; and crossing this stream at Connell's mill into the forks at Ryerson's station, being by estimation 25½ miles from the Ohio river, upon the route described; and 260 feet above the level of High water mark at that river.

Thence immediately across the Duncard fork of Wheeling creek, and ascend the northern side of it ½ mile at the rate of 20 feet per mile to Samuel Vanata's; thence up Miller's fork 4 miles ascending 80 feet at 20 feet per mile to Big run on the north; thence up the latter 2 miles ascending 160 feet at 80 feet per mile, to the junction of three small streams, thence up the ravine of the middle one, ½ mile ascending 70 feet to the fork of this ravine, thence, turning to the right, ¼ mile ascending 100 feet to the natural summit of the ridge between the Duncard fork of Wheeling creek and Scott's or Roberts' branch of the South fork of Ten mile creek: here the distance upon this route from the Ohio river is, by estimation, 32¾ miles, and the height of the summit 680 feet above high water mark of that river at the Flats of Grave creek.

The route will then immediately descend on the Ten mile creek side of the ridge into the ravine of Roberts' run; thus, ⅛ mile descending 100 feet; ⅛ mile descending 40 feet; and ½ mile descending 50 feet to Montgomery's; and thence 1¾ miles descending 100 feet at the rate of 57 feet per mile, passing Roberts' mill to the junction of this stream with Gray's branch; and intersecting the route by the South fork of Ten mile creek, as herein before described—distance from the Ohio river at the Flats of Grave creek, by estimation, 35¼ miles; and the height above the level of high water mark of that river, is estimated at 390 feet.

	Miles.
Estimated distance from this intersection to the town of Wheeling, passing by Gray's Braddocks, Ackley's, and Wheeling creek,	33½
Estimated distance from this intersection to the Ohio river at the Flats of Grave creek, by the route examined and now described,	35¼
Difference against the Grave creek route, =	1¾

Upon the route to Wheeling passing Gray's, Braddock's, and Ackley's, there is but one summit, the height of which above tide is estimated at 1177 feet: whilst upon the Grave creek route there are two summits, viz. the one between Grave creek and Wheeling creek 600 feet above high water mark, at the Flats of Grave creek, or 1241 feet above tide; and the other between Wheeling creek and the South fork of Ten mile creek 1287 feet above tide—the route between these two summits, at Ryerson's station is depressed to a level of only 901 feet above tide; from the station the ascent towards Grave creek is therefore 340 feet. By estimation, either of these summits is higher than the one at Braddock's upon the route to Wheeling; the one by 64 and the other by 110 feet; consequently the altitudes to be overcome upon the Grave creek route are greater than those upon the Wheeling route by 450 feet. There would be some heavy cuts to make in the ridges upon the Grave creek route, and at the same time grades of 92 feet to the mile must be adopted, as well as curvatures of 400 feet radius upon other parts of the line.

It was stated by persons of intelligence that the facility of locating a line of railway from this place to the Ohio canal, or to the navigation of upon Still-water creek, will be as great by means of the ravine of Pipe creek, as it would be from Wheeling by the ascent of Indian Wheeling creek: of this however, no data by which we can form a judgment have been obtained by means of instrumental surveys. In regard to the probable relative cost of construction, it may be observed, that although there would be several bridges to erect upon the Grave creek route, yet it is probable that the graduation and masonry upon it would cost less than upon the route to Wheeling: This advantage, however, would not compensate for the loss that would be experienced from the greater heights to be overcome.

Before dismissing the subject of the route to the Flats of Grave creek, it may be proper to state, that, in the views of the people at that place and in its vicinity, the very fine tract of level, or nearly level, land, situated upon the Ohio river there, should form the principal inducement to cause the Railroad to terminate at Elizabethtown, or at the Ohio, upon these Flats.

This tract of land, surrounded by fine rolling hills, and intersected by the Ohio river, is, indeed, beautiful; whilst the tumuli yet standing in bold relief upon the plain, present to the sight mounds of earth of larger dimensions than are known to exist as the work of human agency, any where north of Mexico; and indicating the preference given to this spot as a residence by an ancient and departed race.

The surface constituting the apparently level part of this amphitheatre may amount to three or four thousand acres, of which about one thousand lie upon the western side of the river.

Nature has formed the place as if for the seat of a great mart, but man has hitherto neglected to build the city.

Of the Route by Cheat River.

So much of this route as extends from Cumberland up the north branch of the Potomac river, and along the mountain slopes of the Savage river and Crabtree creek to the summit of the Little Back-bone mountain, has already been given, in describing the route by Deep creek. From this summit, 2593½ feet above the level of tide, or, after an excavation of 29½ feet in depth, 2564 feet above tide, the line will descend into the Glade of the Little Youghiogheny, and down this stream through the pass of Hoop-pole ridge to Armstrong's, and thence through the pass by the base of Roman-nose mountain, in a direction towards the mouth of Cherry-tree creek; but striking the Youghiogheny river opposite to the mouth of Snowy creek, at a level of 2350 feet above tide. In this descent of 214 feet from the mountain summit, the line will decline for 1½ miles at the rate of 92 feet per mile to the Glade, from whence to the river the grade for 9½ miles will average only 8 feet per mile of descent, though it may undulate near Armstrong's. Crossing the Youghiogheny upon a viaduct of from 200 to 300 feet in length, the line will ascend the valley of Snowy creek through the gap of Snaggy mountain, and for a distance of 8 miles at an ascent of 20 feet per mile on an average to the head of this stream upon the eastern side of Briery mountain, and interlocking with the head branches of Salt-lick creek, a tributary of Cheat River. The height of this summit is about 2510 feet above tide. Thence the route will proceed down the ravine, or slopes of the Salt-lick creek to Cheat river. The distance down this creek will be about 11 miles and the descent 1012 feet at the rate of 92 feet to the mile. Thence the line will pass the Briery mountain at the gap through which the Cheat river flows, and thence descend that river to and along the Duncard bottom to Buckner Fairfax's at the State road; having traversed the river 10½ miles, and descended 138 feet at about 13 feet per mile. From this point the river for 4 miles to the mouth of Muddy creek on the right has a fall of only 30 feet, or 7½ feet per mile. Here, however, the Cheat river assumes the character of a mountain torrent, having great fall in a narrow channel confined between mountains that rise immediately from the waters' edge. In a distance of 9½ miles to the mouth of Sandy creek on the right the fall is 285 feet at the rate of 30 feet per mile upon an average: thence to the junction with the Monongahela, (2½ miles within the State of Pennsylvania,) 20 miles, descending 275 feet at the average rate of 13¾ feet per mile; thence down the Monongahela river 3½ miles, descending 7 feet at 2 feet per mile, to a point opposite to the mouth of Duncard creek on the left; and thence continuing down

the river 20½ miles, descending 2 feet per mile to the mouth of Ten Mile creek on the left. Here the river would be crossed by a viaduct about 700 feet in length; and it is here that this route intersects with the line already described extending from Cumberland by Brownsville to Wheeling. At this point the route to Wheeling would leave the river and pass up Ten Mile creek as already described, whilst the branch to Pittsburgh would continue along the Monongahela.

A synopsis of the route from Cumberland to the mouth of Ten mile creek at Millsborough upon the Monongahela, by way of Cheat river, as above described, may now be given, as follows, viz:

Distance in miles.		Per mile in feet.	Total of grade in feet.	Total distance in miles.	Height above tide in feet.	
					628.	Cumberland 50 feet above bench mark, at one mile below.
29.	ascent	9.57	277.5	29.	905.5	Passing up Potomac to mouth of Savage.
18.	ascent	92.	1658.5	47.	2564.	Up Savage & Crabtree to sum. of Little Backbone mountain and cut 29·5 feet.
1.5	descent	92.	138.	48.5	2426.	To Yough. glade. Then down Little Youghiogeny river.
9.5	descent	8.	76.	58.	2350.	At Yough. river and mo. of Snowy creek. Then cross the river.
8.	ascent	20.	160.	66.	2510.	Up Snowy creek, to head at Cranberry Swamp.
11.	descent	92.	1012.	77.	1498.	Down Saltlick creek to Cheat river.
10.5	descent	13.	138.	87.5	1360.	Down Cheat river thro' gap of Briery mountain to State road at Bckner Fairfax's and lower end of Duncard bottom.
4.	descent	7.5	30.	91.5	1330.	Mouth of Muddy creek on right.
9.5	descent	30.	285.	101.	1045.	Mouth of Sandy cr. on right.
20.	descent	13.7	275.	121.	770.	Mouth of Cheat river, thence down the Monongahela.
3.5	descent	2.	7.	124.5	763.	Mouth of Duncard creek on left.
20.5	descent	2.	41.	145.	722.	Mouth of Ten mile creek on left and crossing the Monongahela to Millsborough on its left bk.

	Miles.
From Cumberland to the mouth of Ten mile creek on the Monongahela, by way of Cheat river, the distance is therefore estimated at,	145
From the mouth of Ten mile creek to Wheeling, say,	60
From Cumberland to Wheeling by the Cheat river route, =	205

And since the mouth of Ten mile creek is 60 miles above Pittsburgh upon the line as proposed for the railroad, therefore, the distance from Cumberland to Pittsburgh by way of Cheat river is the same as to Wheeling, viz: 205 miles; whilst the railway directly connecting Pittsburgh and wheeling will occupy the same ground, and consequently be of the same length, as before; that is, 120 miles.

This route by Cheat river would therefore involve the construction of railroad to the following extent, viz:

	Miles.
From Cumberland to the Monongahela at the mouth of Ten mile creek, =	145
From the mouth of Ten mile creek to Wheeling, =	60
From the mouth of Ten mile creek to Pittsburgh, =	60
Total, =	265

The total length of railroad to be constructed from Cumberland to Wheeling, and to Pittsburgh, in case the route with a tunnel and grades of 92 feet per mile by the way of Wills' creek and Casselmans river, be adopted, would, as has been herein before estimated, be 232 miles; but if the route, pursuing the same streams without a tunnel, and having no grade in the Alleghany mountains steeper than 50 feet per mile, should be chosen, then the total length of railroad would be 245 miles. Wherefore, the route by Cheat river as it has been described, involves the construction of a greater length of railroad than one of the routes by Casselmans river by 33 miles; and greater than the other by 20 miles.

Another route by the ravine of Cheat river would leave the Monongahela at the mouth of Duncard creek, and thence it would ascend this stream, and descend Wheeling creek to the town of Wheeling.

The distance along Duncard creek, from the forks to its confluence with the Monongahela, as reported 5th April, 1828, by Dr. Wm. Howard, Col. S. H. Long, and Capt. W. G. McNeill, acting as a board of Engineers for the Baltimore and Ohio Railroad Company, is 23 miles: and the distance along Wheeling creek from the junction of the Duncard fork with the north branch, as herein before estimated, is 18 miles to Wheeling. Then, as the space lying between the respective points now referred to upon Duncard

and Wheeling creeks, and crossing the dividing ridge, has not been examined, we may form an approximate estimate of the distance by means of a map of that section of the country. Measuring upon the map gives the direct distance at about 21 miles; and after a reasonable allowance for elongation from the necessary curves that must doubtless be introduced, we assume 29.5 miles as the probable distance of a route for a railroad. Hence the distance from the Monongahela to Wheeling by the route of Duncard and Wheeling creeks, is estimated at 70.5 miles. The summit to be passed upon this line between Duncard and Wheeling creeks, is probably as high as that between a southern branch of the former and Fish creek, as estimated by the board of Engineers just mentioned, viz: 496 feet above the level of the line at the mouth of Duncard creek. The railroad level at this point upon the Monongahela, being 763 feet above tide, according to the preceding synopsis, it follows, that the ridge between Duncard and Fish creeks, is 1259 feet above tide: if this be assumed as the altitude of the same ridge between Duncard and Wheeling creeks, it will be 82 feet higher than the ridge at Braddock's, between the latter stream and Ten mile creek.

The distances by this route will probably be as follows, viz:

	Miles.
From Cumberland by the route of Cheat river to the Monongahela at the mouth of Duncard creek,	124.5
From thence by Duncard and Wheeling creeks to the town of Wheeling,	70.5
Total from Cumberland to Wheeling by this route	= 195.
From Cumberland to the Monongahela at the mouth of Duncard creek, as above,	124.5
From thence down the Monongahela to the city of Pittsburgh	80.5
Distance from Cumberland to Pittsburgh by the Cheat river route, (the same as before,)	= 205.
From Cumberland by Cheat river to the mouth of Duncard creek as above,	= 124.5
Thence by Duncard and Wheeling creeks to Wheeling	= 70.5
And from the same point to Pittsburgh by the valley of the Monongahela	= 80.5
Therefore the total length of railroad to construct upon these routes would be	= 275.5

Being 10½ miles greater than by the Cheat river route if extended to the mouth of Ten mile creek, before leaving the Monongahela in passing to Wheeling: To which let it be added that by the Duncard creek route the distance by railroad between Pittsburgh and Wheeling would be 151 miles, whereas upon the route by Ten mile creek it would be only 120 miles.

In the event of the route by Cheat river being adopted, it would be better, therefore, with a view to extending the railroad to both Pittsburgh and Wheeling, that the main stem should descend the Monongahela to the mouth of Ten mile creek, where the branch to Pittsburgh would diverge, than that by passing up Duncard creek, it should cause the point of divergence to be at the confluence of the latter stream with the Monongahela.

Regarding the practicability of a route for a railroad from the Potomac to the Cheat river as decisive of the feasibility of any route having a part of the ravine of the latter stream in its course, (the practicability of forming the work along the river itself being assumed), I continued my reconnoissance from Cumberland to the Cheat river at the Duncard bottom; passing along in the Youghiogheny Glades; and thence crossing the Youghiogheny river near the confluence of Snowy creek, I passed to the head of the latter stream at a place called the Cranberry Swamp, where a connection with the ravine of the Salt lick, a branch of Cheat river, could be formed by means of a favorable depression in the summit. Three small branches of the Salt lick, unite in this immediate vicinity, each having but a short distance before the junction, a cascade of some 50 or 60 feet in perpendicular height. This bold feature in the stream near its head would compel the line of a railroad to occupy the steep sides of the hills from the very commencement of the descent to Cheat river: And it is probable that the route would continue upon these slopes until it gained the river level. The ravine of the Salt lick is believed to offer the most practicable route to, and from, the Cheat river at a grade not exceeding 90 or 100 feet to the mile, that can be obtained. A much shorter line than the one proposed could be run from the head of Salt lick to the lower end of the Duncard bottom by way of Ashby's Gap through Briery mountain: But in this case the descent would be, according to the report of F. Harrison, jr., to the board of Engineers last mentioned, 1196 feet, and the distance only 4½ miles. The rate of descent would therefore average about 266 feet to the mile. And it is sufficiently obvious that so abrupt a slope could only be passed by means of stationary Engines and the usual appurtenances of inclined planes, the motive power being

steam. Could a line be run in a direction down the river, having the desired grade, the distance would be much shorter than by the way of the Salt lick; such however, is the character of the ground, from the numerous deep ravines with which the mountain sides is furrowed, the steepness of the slopes, and from the presence of a quality producing avalanches, that we are appalled in contemplating the possibility of building a road for many miles upon such ground. Whether a more feasible line could be traced more northerly by the Pine Swamp, and thence down the ravine of the western Muddy creek, than we have proposed by the Salt lick, is uncertain, and doubtful. And in conclusion, not having personally examined the Cheat river below the Duncard bottom, I shall here, for the sake of the information which it conveys of that river, where, for many miles together it assumes and maintains the wildest character of the mountain torrent, again quote the report of the Engineers above named: They say,

"Cheat river for about 4 miles below the Duncard bottom to the mouth of Green's run, has moderate bottoms on either bank, some of them cultivated and very fertile. Below this point, the valley gradually assumes that rough and wild appearance which is the characteristic of this river. The bed of the stream is frequently interrupted by huge masses of rock, many of them as large as a moderate house, which are sometimes so abundant that we were often enabled to pass over by leaping from rock to rock. The mountains which form its banks, rise almost immediately from the waters' edge, presenting their steep sides at an angle of 40 to 50 degrees: and ascending to the height of 700 to 800 feet. Such being the rough character of this valley from the mouth of Green's run to a little above Ice's Ferry, a distance of 16 miles, it is of course entirely uninhabited: Indeed in this distance, there is scarcely level ground enough on which to place the foundation of a small cabin. Its wildness may be imagined, from the fact that we were for three days industriously occupied in making this distance of 16 miles. This was only accomplished (of course on foot, as no horse ever penetrated here,) by clambering with excessive fatigue over rocks at the constant risk of falling from them, and by frequently fording the river to take advantage of the best ground on either side;" and further: "notwithstanding what we have here said of the valley of Cheat river, we believe that a Railroad might be made along its course with much less difficulty than the wildness of the country would lead, at first sight, to apprehend. For although the hill sides are steep, there is almost always a good and sufficient bench to place a wall upon, for which the hill itself being composed of rock, would afford the materials; and these having to be brought from above, might be procured and placed with much less labor than would be required under other circumstances. The greatest

danger to the road, when made, would arise from the avalanches of rock or timber from which it would be extremely difficult entirely to guard it. The right bank of the stream appeared to be decidedly the most favorable as far down as the mouth of Sandy; below this point there was some hesitation in forming our opinion, but our decision was still in favor of the same bank."

In conclusion, it may be stated that the route in passing to Cheat river attains an altitude of 2564 feet above tide, whilst the route, No. 6, in crossing the dividing mountain between Wills' creek and Casselman's river, reaches an altitude of only 2278 feet above tide: The latter therefore has a lower extreme summit than the Cheat river route, by 286 feet. Moreover, in going westward the Cheat river route again ascends in the valley of Snowy creek 160 feet; viz: from a level of 2350 feet to that of 2510 feet above tide; whilst the route by Casselman's river again ascends in the valley of Dunbar creek, 136 feet, that is, from a level of 989 feet to that of 1125 feet above tide. Consequently the amount of the summits overcome upon the Cheat river route in passing from Cumberland to the Monongahela at the mouth of Ten mile creek, is greater than upon the Wills' creek and Casselman's river route, in passing westwardly to the same point, by 310 feet.

Permit me to add that in this reconnoissance I have been aided by the very polite attention of gentlemen at Cumberland, Uniontown, Brownsville, Pittsburgh, Wheeling, Waynesburgh, Elizabethtown, and parts adjacent; as well as by the citizens along the routes in the counties of Alleghany, in Maryland; Fayette, Greene, Washington, and Allegheny, in Pennsylvania; and in Preston, Ohio, and Marshall, in Virginia.

All which is respectfully submitted,

J. KNIGHT,

Chief Eng. Balt. & O. Rail Road.

[B.]

Sixth Annual Report of the Superintendent of Graduation, Masonry and Construction of the Baltimore and Ohio Rail Road.

Office of the Superintendent of the Baltimore and Ohio Rail Road.
Ellicott's Mills, Md., 1st Oct., 1835.

To Phillip E. Thomas, Esq.,
President of the Baltimore and Ohio Rail Road Company.

Sir,—At the date of my last annual report, the Graduation, Masonry and Construction, of the Baltimore and Ohio Railroad and of the lateral Railroad to Washington City were rapidly advancing. I have now the gratification to report that the operations, on the Baltimore and Ohio railroad, then in progress, have since been finished, and that the road was on the first day of December, 1834, formally opened for travel and traffic from the "Point of Rocks" to Harper's Ferry: And that on the first day of July last the construction of the Lateral Railroad to Washington City had been so far advanced, as to admit, on that day, of the passage of a Locomotive Engine, with a train of cars over it, very nearly as far as the north line of the District of Columbia, in the vicinity of Bladensburg, and on the 20th of that month was formally opened for travel to that line. Owing to a disappointment in the receipt of rails from England, the remainder of the line, extending from that point to the Pennsylvania Avenue, in the City of Washington, and embracing a distance of about five miles, could not be prepared for use before the 25th day of August, on which day it was opened, with appropriate ceremony, for the regular conveyance of passengers.

In addition to the accompanying tables marked B 1, 2, 3, 4, 5, 6, and other papers marked T. U. V. W. X. Y. Z., only a few observations are necessary, to present a full report of the proceedings of this department. These tables exhibit the work in detail and its cost, and the papers also furnish copies of such printed notices and other information as is generally given to persons disposed to take contracts under this Company, as well as the manner the various kinds of work are required to be executed when contracted for.

Graduation and Masonry of the Baltimore and Ohio Railroad.

The 6th Division of this road extends from the end of the 5th Division at the "Point of Rocks," on the left bank of the Potomac river, to the bridge of the Messrs. Wager, across that

river at Harper's Ferry. The first two miles and ten poles around the Narrows, occasioned by the lower and upper Points of Rocks, and the last two miles, beginning east of Miller's Narrows, and extending along those and Harper's-ferry Narrows, to the Bridge at Harper's-ferry, were graduated for the reception of the railway, by the Chesapeake and Ohio Canal Company. The graduation and masonry of the intermediate space, comprehending a distance of 8 miles and 119 $\frac{32}{100}$ poles, were generally commenced about the 15th July, 1834, and were so rapidly prosecuted that the completion of the Railway upon it was effected by the first day of the December following. The quantity of earth removed and supplied, inclusive of rock, on this intermediate space, was 150,224 cubic yards, at the gross cost of $58,993.34 exclusive of contingencies, but inclusive of grubbing, clearing and transportation; or at an average cost per cubic yard of 39 $\frac{27}{100}$ cents; or of $42.21 a pole lineal, and of $13,508.08 a mile. Table B No. 1 exhibits the names of contractors by whom this work was so energetically and satisfactorily executed, their prices, &c.

The masonry built upon this intermediate part of the 6th Division is detailed in Table B No. 2 and is there shown to have amounted to 13,536 $\frac{3}{4}$ perches of 25 cubic feet to the perch. It is contained in five bridges, numerous culverts and two detached walls. Its gross cost was $54,129.24 and average cost per perch $3.99 $\frac{3}{100}$. The table referred to presents the names of the contractors and their respective prices.

Table B No. 3 is referred to for a succinct view of the cost of the graduation and masonry of the whole line of this road from Pratt street, Baltimore, to Harper's-ferry, and inclusive of the branch road to the city of Frederick. By this table the quantum of the graduation of the whole line is shown to have required the removal and supply of 2,660,937 cubic yards of earth inclusive of a large proportion of rock, at a cost of $883,140.74 and the construction of 93,419 $\frac{1}{2}$ perches of masonry at a cost of $372,497.01, aggregately amounting to the sum of $1235,637.75, being at the average rate of $15,561.58 a mile. By an inspection of the recapitulation to this table it will be perceived that the average aggregate cost per mile of the graduation and masonry, declines in amount regularly from the end of the First Division to the termination of the road as follows, viz: at the end of the 1st division it is $46,354.81—of the 2d $29,252.35; of the 3d $20,376.18,—of the 4th $17,671.72 —of the 5th $16,128.84, and at the end of the 6th $15,840.04,—and inclusive of the lateral branch to the city of Frederick it is only $15,561.58.

By this table it is further shown, that the average cost per cubic yard of the 2,590,689 yards of earth, inclusive of a large proportion of rock, as well as of the grubbing and clearing, which was handled in effecting the graduation of the line to Harper's ferry, was 32 $\frac{12}{100}$ cents, and that the average cost of the whole per cubic yard, when the 70,248 yards, fully half of which was rock, and its cost, of the branch to Frederick, is added, is raised to 32$\frac{43}{100}$ cents.

And that the 93,419$\frac{1}{2}$ perches of masonry, inclusive of the cost of four superstructures of wood, one which, that across the Monocacy river, was very extensive, cost at an average, on the whole line, to Harper's ferry, inclusive of the branch to Frederick, $ 3,98 $\frac{84}{100}$ a perch.

This large quantum of masonry, is partly contained in a very great number of gothic and common culverts, and a few detached walls, but much the larger portion of it, in the following described bridges, all of which were designed by my late intelligent and energetic assistant, Mr. Robert Wilson, except the Carrollton, the Patterson, and the Oliver viaducts, which were designed by myself, and that with a superstructure of wood across the Monocacy river, which was designed by Mr. Lewis Wernwag, its enterprising contractor; viz.

The "Carrollton viaduct," over Gwynn's falls, of two arches of 80 and 20 feet chord respectively.

The "Patterson viaduct," of four arches, 2 of 55 feet, and 2 of 20 feet chord respectively, built across the Patapsco river.

The "Oliver viaduct," of 3 arches of 20 feet chord each, over the Frederick turnpike road, and Ellicott's branch.

The bridge across the Monocacy river, of 3 spans of 110 feet each.

One across the greater Catoctin creek of 2 arches, of 50 feet chord each.

One over the Frederick turnpike road, and a contiguous branch, near Parrsville, of 2 arches, of 20 and 10 feet chord, respectively

One across the West fork of the Patapsco river, near Marriottsville, of one arch of 40 feet chord.

One across Ballinger's creek of 1 arch, of 30 feet chord.

Four of 1 arch each, of 25 feet chord, viz: across Gadsby's run, Gillis' Falls, Bush and Israel's creeks.

Seven of 1 arch each, of 20 feet chord, viz. across Gwynn's run, Roberts' run, Caton's branch, a branch opposite the Union factory, Piney run, the Tuscarora, and lesser Catoctin creeks.

One of 20 feet span, superstructure of wood, over the Frederick and Georgetown turnpike road.

One of 1 arch, of 15 feet chord, across Dorsey's run, near the Avalon works.

One across Clagget's branch, of 15 feet span, superstructure of wood.

Three of 1 arch, of 14 feet chord, viz: over Warfield's road, Davis' and Marriott's branches.

Nine of one arch each, of 12 feet chord.

One of 12 feet span, superstructure of wood, and four of one arch each, of 10 feet chord.

Bridge across the Potomac river, at Harper's Ferry.

This heavy work has been very recently put under contract. It is expected that it will be completed within one year. The contractors are Charles Wilson, for the masonry, and Lewis Wernwag, for the superstructure of wood, both of whom are well known to the Company as contractors of skill, energy and fidelity.

Construction of the Baltimore and Ohio Rail Road.

As soon as practicable after the superintendency of this branch of the service of the Company was confided to me, measures were adopted to obtain a supply of the requisite materials for the construction of a single track of railway from the "Point of Rocks" to Harper's Ferry, and for such parts of a second track, as were indispensable, as passing places. It was found very difficult to obtain a supply in the short time it was desired. The greater portion of the string pieces are of yellow pine, procured in North Carolina, and partly conveyed by the Chesapeake and Ohio Canal from Georgetown, and partly by the Railroad from Baltimore to the "Point of Rocks." The sleepers were procured in the immediate neighborhood of the work. The plan upon which the work was executed is fully set forth in the accompanying paper Z. The horse path was paved in such places where the railway was in contact with other roads, and particularly in the street of Berlin, at Weverton and at Harper's Ferry narrows, at which latter places its site is also that of the Frederick and Harper's Ferry turnpike roads. The remainder was Macadamised in the best manner, with stone of the hardest quality reduced to particles not exceeding four ounces in weight. Twelve miles and $119\frac{5}{10}$ poles of first track, and $295\frac{50}{100}$ poles of second track and ten turnouts, were laid at a gross cost of $47,353.49, inclusive of the cost of all materials, (except the prime cost of the rails,) their

inspection, transportation, distribution, &c. and of the cost of the horse path, superintendence and all other contingent expenses, which is an average cost of $3,561.25 a mile. But the prime cost of 22 tons of rails, the quantity used on a mile, at $45 a ton or $990 a mile, must be added to $3,561.25, which shows the actual cost per mile, to have been $4,551.25, inclusive of the cost of nearly, if not all, the turnouts which will be necessary when the second track shall have been laid continuously throughout the whole line. The horse path cost at the high rate of 783.12\frac{84}{100}$ a mile, owing to the inconvenience of obtaining stone of suitable character, and the rapidity with which the work was executed. The second track may be laid at a less average cost.

The contractors who laid the rails were Messrs. John Littlejohn, Matthew Borland, and James Thompson;—the turnouts were inserted by Messrs. Reuben Aler and Jesse Hay, and the horse path was formed by Messrs. Thos. M. Macubbin and David Lemmon.

Graduation and Masonry of the Lateral Rail Road to Washington City.

This Road was divided into five parts, denominated the First, Second, Third, and Fourth Divisions, which terminate at the north boundary line of the City of Washington, and the City Division, which ends at the basin of the city canal at 6th street west, in Washington, which has yet only been graduated as far as the Pennsylvania avenue.

The graduation of the first division was commenced, generally, about the 10th of October, 1833; that of the second and third, and 1st section of the fourth, about the 20th of January, 1834; that of the 2d and 3d sections of the fourth division, about the 1st of January, 1835—and that of the city division, about the 1st of May, 1835.

Three of the most difficult and expensive sections of the second division, viz: the 1st, 4th, and 8th, were placed under the management of agents of the Company. For my views on the subject of effecting the graduation by agents of the Company, the accompanying paper marked S. is respectfully referred to.

Table B No. 4, exhibits in detail the several sections, the names of the contractors and others by whom the work was performed, the prices, quantum of earth handled on each section, &c. From this table it appears that the whole quantum of

earth removed and supplied on these several divisions, inclusive of 32,727½ yards of rock which occurred on the 1st section of the 1st division, and was the only rock met with in the excavations of the whole line, was 1,991,352 cubic yards, which was handled at a cost of $664,530.08. or at the average cost of $33\frac{37}{100}$ cents a yard, inclusive of the grubbing, clearing, and transportation.

The 1st section of the second division was placed under the management of that experienced and faithful agent, Mr. Jonathan Jessop, by whom it was most satisfactorily conducted to its completion.

To the management of the 4th section of the second division, Mr. John Watson was assigned. Mr. Watson had been long and advantageously known in this community as the efficient superintendent of the repairs upon the Frederick and Boonsboro' turnpike. He continued to manage this section in the most satisfactory manner, until his lamented death, which occurred late in the month of November, 1834, at which time the graduation was so nearly completed, that about two weeks more of his efficient services would have finished it.

It is due to the memory of Mr. Watson for me to state, that a more faithful and competent agent could not have been selected. After an intimate intercourse with him as a manager of Public works for more than seventeen years, I am enabled to say that, during all that period he conducted himself in the most exemplary manner, both as a gentleman and public officer. His industry, energy and unremitting attention to the duties confided to him were rarely equalled and could not be surpassed. His veracity and integrity were as unimpeachable as his fidelity was unquestionable. He was generous almost to a fault, and as brave as he was generous. The loss of such a man under any circumstances is a public calamity, and when we call to mind the sudden and shocking manner by which he fell, his death must always be remembered with feelings of unfeigned regret and sorrow.

The management of the graduation of the 8th section of the 2d division was confided to Mr. Trueman Belt. Mr. Belt conducted it in a satisfactory manner until it was nearly completed, only about 4000 yards of excavation remaining, when he discontinued his operations.

Table B No. 5, exhibits the names of the contractors by whom the masonry was built, their respective prices, the character and cost of the several structures, &c. With the exception of the "Thomas Viaduct," across the Patapsco river, the masonry was generally commenced, simultaneously, with the graduation

of the divisions. That stupendous structure was begun on the 4th of July 1833, and completed by its energetic contractor, Mr. John McCartney, of the State of Ohio, on the 4th of July, 1835. The beautiful and imposing design of that viaduct, was furnished by B. H. Latrobe, Esq. Civil Engineer, and the designs of all the other structures on this road were prepared by my assistant Mr. Robert Wilson, who superintended the construction of all the masonry. The whole quantum built, is shown by the table last referred to, to have been 46,906¾ perches, of 25 cubic feet to the perch, at a cost of $275,167.21 or an average cost, per perch, of $5.86 62/100.

These 46,906¾ perches of masonry are contained in many culverts, one very heavy wall connected with the "Thomas Viaduct" and in the following described fifteen bridges, viz:

The "Thomas Viaduct" over the Patapsco river of 8 arches of 58 feet chord, each.

One, of one arch of 60 feet chord across the Greater Patuxent river.

Two, of 1 arch each, of 50 feet chord, across the Lesser Patuxent river, and the north-west branch, the latter near Bladensburg.

One, of five spans, of 25 feet each, over the Paint Branch, superstructure of wood.

One, of one arch, of 20 feet chord, across Hammond's branch.

One, of one arch of 18 feet chord over Deep run.

One, of 2 arches of 14½ feet chord each, across the Tiber creek in 1st street west, in the city of Washington.

One, of 1 arch, of 15 feet chord, across Budd's run.

One, of 1 arch, of 14 feet chord, across the east Branch of Tiber creek, in the Delaware Avenue, Washington.

One, of 1 arch, of 11 feet chord, over Hopkin's road.

Three, of one arch each, of 10 feet chord, viz: over Piney run near Vansville, Duel run, near Bladensburg, and Pierson's Branch near the north line of Washington; and

One, of 8 feet chord, in the District of Columbia.

Table B No. 6, presents a full view of the cost of the graduation and masonry separately, and aggregately, on each section and on the whole line, and shows the whole length of the line from the point of deflection from the Baltimore and Ohio Railroad, to its present terminus at the Pennsylvania Avenue in the city of Washington, to be, 30 miles and 112 poles, and the aggregate cost to have been $939,697.29, or at the average rate per pole lineal of $96.75 63/100 or per mile $30,962.01 9/10. The superintendence and all other contingent expenses amounted to

the sum of $19,475.93 which added to the above sum of $939,-697.29, produces the sum of $959,173.22 as the entire cost of the graduation, masonry, superintendence and all contingent expenses of this road, which is at the rate of 98.76\frac{16}{100}$ per lineal pole, or of $31,603.73$\frac{12}{100}$ per mile.

The estimate of the graduation, masonry and contingent expenses as far as the New Jersey Avenue, a point about $\frac{1}{4}$ of a mile short of the present terminus of the road, was $1027,116.-33, being $67,943.11 cents more than the actual cost, although about $\frac{1}{4}$ of a mile more distance, has been graduated, than was included in the estimate.

Construction of the Lateral Railroad to Washington City.

The length of single or first track of Rail-way which has been laid is 30 miles and 107$\frac{57}{100}$ poles. There has also been laid of second track, a distance of 5 miles and 130$\frac{43}{100}$ poles. The aggregate length of 1st and 2d track is then 35 miles and 238 poles. These railways were partly formed of scantling and partly of logs—for a particular description of each kind, reference is made to the accompanying paper marked Y.—Of the first track, or continuous railway, 17 miles and 175 poles were constructed with scantling, and 12 miles and 252 $\frac{57}{100}$ poles were laid with logs; and of the 2d track, 4 miles and 245$\frac{97}{100}$ poles were formed of scantling and only 204$\frac{46}{100}$ poles of logs. The scantling track is a little more costly than that made of logs, but is greatly preferable and believed to be more durable. It can, in the first instance, be more accurately constructed, and when out of repair, is more easily adjusted, than the log track. Besides it does not so frequently get out of adjustment, because of the greater perfection of its system. With the exception of a short piece in Washington, the 2d track is only laid through the several deep cuts, where it answers the purposes of passing places for the cars, and at the same time affords great facilities in keeping the road clear of the avalanches to which the deep cuts are liable.

The entire first track is laid with the deep or edge rail, except that part extending from North Capitol street to Pennsylvania Avenue in Washington. Of the 2d track 300$\frac{6}{10}$ poles on the 2d Division and 248$\frac{7}{10}$ poles on the 4th Division, are laid with flat rails, such as are used on the Baltimore and Ohio Railroad, all the remainder of the 2d track was laid with the deep or edge rail. Where the flat rail was used, (and it was only used because there was not a sufficient supply of the edge rail) small strips of scantling 4 × 2 inches, were first spiked to the scan-

tling which had been laid for the reception of the edge rail. These strips were necessary to allow the rail to be laid over the centre of the scantling beneath them, and also to make up the disparity in depth or thickness, between the two kinds of rail. It is found to make a very good railway. They can be easily removed when a further supply of the deep rail is obtained, if it should be then thought expedient to do so.

The whole cost of these 35 miles and 238 poles of railway thus laid, and of 12½ turnouts, including the cost of lumber, chairs, screw bolts, spikes, and the cost of all other material (except the prime cost of the rails) inspection, transportation, distribution, workmanship, superintendence and all other contingent expenditures, has been $156,627.86,—being at the rate of $13,69⅓ a pole lineal, or of $4,381,96½ a mile. In the above amount the sum of $5,707.43 expended for suitable implements, sheds, and workmanship, necessary to straighten the rails and dress their ends, is included. The prime cost of the edge rail is assumed at $50 a ton and 63 tons are estimated to the mile, which makes $3,150 a mile as the prime cost of the rails of a single track. This sum being added to the above gives $7,531,-96½ as the entire cost of a mile of single railway on this road, inclusive of the cost of 12½ turn-outs, or for the whole distance which has been laid, viz: 35 miles and 238 poles the gross sum of $269,220.67.

On the remainder of the second track, fewer turnouts will be required, than have been inserted; the transportation of the materials will be done chiefly on the Railroad, and of course cheaper; the graduation which the contractors of the 1st track were required to perform, will be dispensed with altogether; it may be therefore assumed that the construction of it will not cost as much as the first, by at least the sum of $531,96½ a mile, leaving as its actual cost, the sum of $7,000. The remainder of the 2nd. track is in length 24 miles and 297 $\frac{14}{100}$ poles, which at $7,000 a mile, will cost $174,499,93¾. This sum being added to the cost of that already constructed, viz: 269,220.67 gives the gross sum of $443,720.60, as the total cost of two continuous tracks of railway, from the Baltimore and Ohio Railroad, to the Pennsylvania avenue, in Washington, a distance of 30 miles 107 $\frac{57}{100}$ poles.

The estimate for two tracks as far as the New-Jersey avenue, about ¼ of a mile short of the distance to the Pennsylvania avenue, was $432,780.05. The actual cost will therefore probably exceed the estimate, about the sum of $10,940.67. From this excess it would be proper to deduct the cost of straightening the rails, and dressing their ends, an expense not contemplated

when the estimate was made. Without, however, substracting any thing on this account, it will be found, that when the excess of cost in this case, viz: $10,940.67, be substracted from the excess of estimate over the actual cost of the graduation and masonry before shown to be $67,943.11, the actual cost of all the work, has fallen short of the gross estimated cost, the sum of $57,002.44: and if but a very moderate allowance be made for the excess of distance actually constructed over that estimated, it may very reasonably be assumed, that the whole actual cost of the road, will be less than the whole estimated cost, by the sum, of at least $60,000.

The rails were laid on the 1st division,—on the 2d. and 3d. sections of the 4th division, and on the city division, by Mr. Benjamin Cornelius,—Mr. James Giddings laid them on the 2d. division, and Mr. John P. Cowman laid the 3d. division, and the 1st section of the 4th division. All the turnouts were inserted by Messrs. Reuben Aler, and Jesse Hay.

Expenditures.

The whole amount expended by me in the service of the Company up to this date, and which has been regularly and duly accounted for, has been two millions, four hundred and ninety-one thousand, six hundred and thirty-eight dollars and thirteen cents. This large sum has been applied as follows, viz:

To the graduation of the Balt. & O. R. R.	$863,140.74	
To the masonry on ditto,	372,497.01	
To the payt. of the contingent expenses incurred on account of the graduation and masonry, viz: superintendence, instruments, advertising, &c. &c.	40,396.44½	$1,276,034.19½
To the payt. of the right of way, & damages generally on that road.		$26,417.02¾
To the construction of the 6th division of said road, viz:		
Materials, distribution, &c.	$21,043.56	
Workmanship,	14,531.10	
Horse path,	10,413.03	
Contingent expenses,	1,365.80	$47,353.49.

To the repairs of that road for the 6 months, that that branch of the service was under my superintendency.	$11,647.66	
Total expenditure on the B. & O. R. R.		$1,361,452.37¼
To the graduation of the Lateral Railroad to Washington City.	664,530.08	
To the masonry on do.	275,167.21	
To the contingent expenses, incurred on account of the graduation and masonry, viz: superintendence, instruments advertising, &c. &c. &c.	19,475.93	
	$959,173.22	
To the construction of said road, viz: materials distribution, &c.	$109,183.43	
Workmanship,	37,108.99	
To contingent expenses, viz: superintendence, advertising &c. &c. &c.	10,335.44	
	$156,627.86	
To repairs whilst under my superintendency.	3,502.98	
Total expenditure on the Lateral R. R. to Wash'n		$1,119,304.06
Total expended on the graduation, masonry, construction, and repairs of both roads.		$2,480,756.43¼
Expended in the purchase of sundry tools, lumber, &c. &c. which was afterwards delivered to other officers of the Company.		10,881.69¾
Total expenditure in the service of the Company,		$2,491,638.13

An examination of the preceding statement, will show that the contingent expenditures on the whole work, which has been executed under my direction, have not amounted to three per cent on my other disbursements.

It is very gratifying to me to be able to state that, although the operations of my department have been very extensive for

the last two years, no loss, to my knowledge, has occurred to any of the mechanics or laborers employed on the different works, except in a single instance, where a few laborers in the employment of a sub-contractor, lost a small portion of their wages.

The following extract from my report of 1832, may, with great propriety, form a part of this. The subject is a very important one.

"The regulation prohibiting the use of ardent spirits first adopted with your sanction in 1829, has been steadily and rigidly adhered to, and has had, I am confident, a very beneficial influence upon the work. The contractors so generally acquiesced in this regulation, and complied with this stipulation of their contract so faithfully, that I had, only in a single instance, to perform the unpleasant duty of dismissing one of them from the service for an infraction of it. I cannot, however, refrain from again calling your attention to the fact, that licenses are so cheaply and so easily obtained in this State, where the sale of them appears to be only for the purposes of revenue, that grog shops became very numerous in the immediate vicinity of the line, and were highly prejudicial to the laborers, to the contractors, and to the progress of the work, and my opinion remains unchanged, that a legislative enactment preventing the vending of ardent spirits within a specified distance of public works could not fail of producing good effects, or rather of preventing much evil."

In conclusion it is proper for me to present to your favorable notice the names of such assistants, as have aided me, in the superintendency of the heavy and arduous operations, of the last two years. Mr. Robert Wilson, not only superintended the construction of the masonry during that period, but also from the commencement of the road. As before remarked, he drew the designs of many, of the very numerous structures which have been erected and their permanency affords ample testimony of the attention he bestowed on their construction. They will remain lasting monuments of his ability and fidelity. Mr. John D. Steele entered the service about two years ago as principal assistant superintendent of Graduation and Construction, and to his talents, exertions and unceasing industry, the work is mainly indebted, both for the fidelity of its execution and rapid completion. I have learned, with great pleasure, that the President and Directors have testified their approbation of his services by appointing him to a trust of great responsibility. Messrs. John Miller, Paul H. Borland, Thomas C. Atkinson, William Matthews, John Patterson, Hopewell Dorsey, George

MacLeod, J. C. Price, Oliver C. Morris, George Holtzbecher, D. A. Watterston, Caleb B. Moore, Wm. K. Coulter, Wm. P. Elliott and C. H. Matthews, rendered, at various times and for periods of different durations, very valuable services, on the graduation and construction, as did also Mr. Christian Slemmer in his office of Inspector of Lumber, and Wm. S. Woodside as clerk.

It is with great regret, that I have to state, that Jonathan C. Price, a young man of most amiable deportment and of high promise in his profession, died whilst in the service of the Company and not long after he entered it, much lamented by those who enjoyed the pleasure of his acquaintance.

Respectfully submitted,

CASPAR W. WEVER.

(B—No. 1.)

A Statement, exhibiting the number and length of the sections of the Sixth Division of the Baltimore and Ohio Rail Road—the names of the Contractors by whom they were graduated—the quantity of excavation and embankment on each section—the actual cost of each section—the total quantity of earth handled on the Division, and the total cost of the graduation of the Division—accompanying the Sixth Annual Report of Caspar W. Wever, Superintendent. 1st October, 1835.

No. of Sections.	Length of Sections in poles.	Total length of Division. Miles.	Total length of Division. Poles.	Names of Contractors.	Solids in cubic yards. Excavation.	Solids in cubic yards. Embankment.	Price, in Cents, of the greater solid.	Cost of each Section. Dolls.	Cost of each Section. Cts.	Total quantum of earth actually handled on the Division.	Total cost of the Division. Dolls.	Total cost of the Division. Cts.	LOCALITY.
1	78.78	.	78.78	Robert Williams,	3,945	3,960	36	.	.	.	.	.	
.	.	.	.	Do.	2,148	.	100	3,573	60	6,108	3,573	60	This section begins at a point 2 miles and ten poles above or west of the "Point of Rocks," to which point the graduation was done by the Chesapeake and Ohio Canal Company.
2	193.93	.	272.71	Johnson Garrett,	11,485	11,104	30	3,445	50	17,593	7,019	10	This section crosses Poplar and Sugar Tree Branches.
3	182.24	1	134.95	John Littlejohn,	30,829	9,818	53½	16,493	51	48,422	20,512	61	This crosses the Greater Catoctin Creek.
4	303.03	2	117.98	P. Orville Littlejohn,	22,740	22,770	48½	11,053	15	71,192	34,565	76	This crosses the Lesser Catoctin Creek.
5	315.15	3	113.13	Matthew Borland,	6,613	10,597	23	2,437	31	81,789	37,003	07	
6	297.00	4	90.13	Alexander Stewart,	8,854	8,424	32	2,833	28	90,643	39,836	35	
7	327.15	5	97.28	G. W. Higgins,	6,548	15,407	24	3,697	68	106,050	43,534	03	This section runs through the town of Berlin.
8	303.03	6	80.31	Robert Kimble,	7,598	6,698	22	1,671	56	113,648	45,205	59	
9	230.30	6	310.61	Thos. M. Macubbin,	12,767	5,686	29	3,701	56	126,415	48,907	15	Passes Garrott's mill.
10	449.21	8	119.82	David Lemmon,	16,893	20,465	41	.	.	.	.	.	
.	.	.	.	Do.	.	2,619	40	.	.	.	.	.	
.	.	.	.	Thos. M. Macubbin,	.	125	20	9,463	25	149,614	58,370	40	This section crosses the divisional line between Frederick and Washington Counties, and also Israel's Creek, and terminates at a point 2 miles east or below the bridge at Harper's Ferry. From the end of this section to said bridge, the graduation was done by the Chesapeake and Ohio Canal Company.
.	.	.	.	* By sundry persons.	600	.	.	622	94	150,224	58,993	34	

* Several points of Rocks were removed by Messrs. Littlejohn, Higgins and Macubbin; for which $622.94 were paid—the cubic yards in these points are estimated—all the other work was measured.

Note. If the 2 miles and ten poles next above the "Point of Rocks," and the 2 miles next below the Bridge at Harper's Ferry, both of which distances were graduated by the Chesapeake and Ohio Canal Company, be added, then the length of the Division will be 12 miles and 129.82 poles. The total distance from Pratt street, Baltimore, was shown in a former report to be 67 miles 199.16 poles. If to the length of this Division be added the total distance from Pratt street to the "Point of Rocks," then the whole distance from Pratt street to the Bridge at Harper' Ferry, will be 80 miles and 8.82 poles. The graduation between Baltimore and the "Point of Rocks, cost $804,147.40, which, added to the amount shown above, makes the gross sum of $863,140.74.

(B—No. 2.)

An Exhibit of the Masonry on the Sixth Division of the Baltimore and Ohio Rail Road, showing the names of the Contractors by whom it was constructed—its character—the quantum and cost on each section—and the total quantum and cost on the Division—accompanying the Sixth Annual Report of Caspar W. Wever, Superintendent. 1st October, 1835.

No. of Section.	Names of Contractors.	Culverts and Detached Walls.						Arched or Bridge Masonry.								Total quantum and cost of all kinds of Masonry on the Division.			Notes.	LOCALITY.
		No. of perches of 25 cubic feet.	Price per perch.	Cost on each section. Dolls.	Cts.	Total No. of perches on the Division.	Total cost on the Division. Dolls.	Cts.	No. of Vents.	Size of each vent in feet.	No. of perches of 25 cubic feet.	Price per perch.	Cost on each section. Dolls.	Cts.	Total No. of perches on the Division.	Total cost on the Division. Dolls.	Cts.	Quantum.	Cost. Dolls.	Cts.		
1	Robt. Williams,	3.128	1.50	4,692	.	3,128	4,692	.	.	.	.	.	.	.	.	.	.	3,128	4,692	00		
2	Do.	371½	2.75	1,036	74	3,499½	5,728	74	1	12	495¼	3.19	1,579	85	495¼	1,579	85	3,994¾	7,308	59	1	× Sugar Tree Branch.
3	John Littlejohn,	.	.	.	.	3,499½	5,728	74	2	50	3,651	7.75	28,295	25	4,146¼	29,875	10	7,645¾	35,603	84		
4	Charles Wilson,	.	.	.	.	3,499½	5,728	74	1	15	525¼	4.00	.	.	.	.	.	.	.	.	2	× Claggett's Branch.
.	Do.	.	.	.	.	3,499½	5,728	74	1	20	1,431½	4.00	7,932	.	6,103	37,807	10	9,602½	43,535	84		× The Lesser Catoctin Creek.
.	P. Orville Littlejohn,	146½	1.87½	289	69	3,646	6,118	43	.	.	.	.	.	.	6,103	37,807	10	9,749	43,825	53	3	
5	Do.	262	2.05	537	10	3,908	6,555	53	.	.	.	.	.	.	6,103	37,807	10	10,011	44,362	63		
6	Alex. Stewart,	288½	3.00	865	50	4,196½	7,421	03	.	.	.	.	.	.	6,103	37,807	10	10,299½	45,228	13		
7	G. W. Higgins,	401½	2.75	1,104	12	4,598	8,525	15	.	.	.	.	.	.	6,103	37,807	10	10,701	46,332	25		
8	W. B. Wheelock,	212¾	2.45	521	24	4,310¾	9,046	39	.	.	.	.	.	.	6,103	37,807	10	10,913¾	46,853	49		
9	Do.	326¼	1.85	603	56	5,137	9,649	95	.	.	.	.	.	.	6,103	37,807	10	11,240	47,457	05		
10	Charles Wilson,	798½	1.87½	.	.	.	.	.	1	25	1,161¼	4.00	4,645	.	7,264¼	42,452	10	.	.	.	4	× Israel's Creek.
.	Thos. M. Macubbin,	324	1.50	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		
.	David Lemmon,	13	1·87½	2,027	19	6,272½	11,677	14	.	.	.	.	.	.	7,264¼	42,452	10	13,536¾	54,129	24		

Notes 1. In the cost of the Culverts; the sum of $15.12 extra is included.

2. The Bridge of 15 feet span across Claggett's Branch, has a flat Superstructure of wood, the cost of which, viz. $75, and also the sum of $30 paid P. O. Littlejohn, for depositing stone around the abutments for the security of their foundations, are included in the sum of $7,932, stated as the aggregate cost of that bridge, and of the one across the Lesser Catoctin Creek.

3. In the cost of the Culverts $15 extra are included.

4. In the cost of the Culverts built by Chas. Wilson, the sum of $19.62 extra are included.

(B—No. 3.)

An exhibit of the Sections of the 6th Division of the Baltimore and Ohio Rail Road above the "Point of Rocks" showing their length and total distance from Pratt street, Baltimore,—The number of cubic yards of Earth "handled" and perches of Masonry built, and their cost respectively, on each section and on the whole line, including the cost of the lateral Road to the city of Frederick. Accompanying the sixth Annual Report of Caspar W. Wever, Superintendent, 1st October, 1835.

No. of Section.	Length of Section in Poles.	Total Distance from Pratt street. Miles.	Total Distance from Pratt street. Poles.	Graduation. Cubic yards of earth handled. On each section.	Graduation. Cubic yards of earth handled. On the whole Line.	Graduation. Cost. Of each Section. Dolls.	Cts.	Graduation. Cost. Of the whole Line. Dolls.	Cts.	Masonry. Number of Perches of 25 Cubic feet. On each Section.	Masonry. Number of Perches of 25 Cubic feet. On the whole Line.	Masonry. Cost. Of each Section. Dolls.	Cts.	Masonry. Cost. Of the whole Line. Dolls.	Cts.	Aggregate Cost of Graduation and Masonry. Of each Section. Dolls.	Cts.	Aggregate Cost of Graduation and Masonry. Of the whole Line. Dolls.	Cts.	LOCALITY.
.	.	67	199.16	.	2,510,715	.	.	*804,147	40	.	79,882¾	.	.	318,367	77	.	.	1,122,515	17	From Baltimore to end of 5th Division at "Point of Rocks."
.	6.50	69	209.16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	Passing the lower and upper "Point of Rocks" graduated by the Chesapeake and Ohio Canal Company.
1	78.78	69	287.94	6,108	2,516,821	3,573	60	807,721	00	3,128	83,010¾	4,692	00	323,059	77	8,265	60	1,130,780	77	Begins 2 miles and 10 poles from end of 5th Division.
2	193.93	70	161.87	11,485	2,528,306	3,445	50	811,166	50	866¾	83,877½	2,616	59	325,676	36	6,062	09	1,136,842	86	× Poplar and Sugar Tree Branches.
3	182.24	71	24.11	30,829	2,559,135	16,493	51	827,660	01	3,651	87,528¼	28,295	25	353,971	61	44,788	76	1,181,631	62	× The Greater Catoctin Creek.
4	305.05	72	7.14	22,770	2,581,905	11,053	15	838,713	16	2,105¼	89,631¾	8,221	69	362,193	30	19,274	84	1,200,906	46	× Claggett's Branch and the Lesser Catoctin Creek.
5	315.15	73	2.29	10,597	2,592,502	2,437	31	841,150	47	262	89,893¾	537	10	362,730	40	2,974	41	1,203,880	87	
6	297.00	73	299.29	8,854	2,601,356	2,833	28	843,983	75	288½	90,182¼	865	50	363,595	90	3,698	78	1,207,579	65	
7	327.15	74	306.44	15,407	2,616,763	3,697	68	847,681	43	401½	90,583¾	1,104	12	364,700	02	4,801	80	1,212,381	15	Runs through the Town of Berlin.
8	303 03	75	289.47	7,598	2,624,361	1,671	56	849,352	99	212¾	90,796½	521	24	365,221	26	2,192	80	1,214,574	25	
9	230.30	76	199.77	12,767	2,637,128	3,701	56	853,054	55	326¼	91,122¾	603	56	365,824	82	4,305	12	1,218,879	37	× Payne's Branch and passes Garrott's Mill.
10	449.21	78	8.98	23,209	2,660,337	9,463	25	862,517	80	2,296¾	93,419½	6,672	19	372,497	01	16,135	44	1,235,014	81	× The Divisional Line between Frederick and Washington Counties and Israel's Creek, passes Weverton and terminates at Miller's Narrows, two miles East of Harper's Ferry.
.	Several Points of Rocks.			600	2,660,937	622	94	883,140	74	.	93,419½	.	.	372,497	01	622	94	1,235,637	75	
.	640.00	80	8.98	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	Passing Miller's and Harper's Ferry Narrows, and terminating at the Bridge at Harper's Ferry. These two miles graduated by the Chesapeake and Ohio Canal Company.

*This sum was erroneously stated, in the report of 1832, at $804,142 90—instead of $804,147 40.

RECAPITULATION.

Designation of the Divisions.	Length of each Division. Miles.	Length of each Division. Poles.	Total Distance of the end of each Division from Pratt street, Baltimore. Miles.	Total Distance of the end of each Division from Pratt street, Baltimore. Poles.	Graduation. Cubic yards of Earth handled. On each Division.	Graduation. Cubic yards of Earth handled. On the whole Line.	Graduation. Cost. Of each Division. Dolls.	Cts.	Graduation. Cost. Of the whole Line. Dolls.	Cts.	Masonry. Number of Perches of 25 cubic feet. On each Division.	Masonry. Number of Perches of 25 cubic feet. On the whole Line.	Masonry. Cost. Of each Division. Dolls.	Cts.	Masonry. Cost. Of the whole Line. Dolls.	Cts.	Aggregate cost of Graduation and Masonry. Of each Division. Dolls.	Cts.	Aggregate cost of Graduation and Masonry. Of the whole Line. Dolls.	Cts.	TERMINATION OF DIVISIONS.
City	1	111.32	1	111.32	85,647	85,647	25,604	59½	25,604	59½	3,726½	3,726½	23,081	37	23,081	37	48,685	96½	48,685	96½	"First Stone" or City Boundary,
First	11	231.46	13	22.78	1,110,924	1,196,571	355,994	68	381,599	27½	45,574	47,300½	201,231	94½	224,318	31½	557,226	62½	605,912	59	On the north side of the Turnpike Road at Ellicott's Mills.
Second	11	219.89	24	242.67	307,106	1,503,677	89,447	07½	471,046	35	9,837¼	57,137¾	28,880	04½	253,193	36	118,327	12	724,239	71	Forks of the Patapsco River.
Third	17	104.29	42	26.96	376,254	1,879,931	114,332	38	585,378	73	7,860¾	64,998½	18,944	26¾	272,137	62¾	133,276	64¾	857,516	35¾	Summit of Parr's Ridge.
Fourth	14	163.08	56	190.04	309,539	2,189,470	109,348	32	694,727	05	9,210¾	74,209¼	33,246	73¼	305,484	36	142,595	05¼	1,000,111	41	West Bank of the Monocacy River.
Fifth	11	9.12	67	199.16	250,995	2,440,465	78,507	77	773,234	82	5,085½	79,294¾	12,051	44	317,535	80	90 559	21	1,090,670	62	"Point of Rocks" on the left bank of the Potomac River.
Sixth	12	129.82	80	8.98	150,224	2,590,689	58,993	34	832,228	16	13,536¾	92,831½	54,129	24	371,665	04	113,122	58	1,203,793	20	Bridge at Harper's Ferry.
Lateral Road to Fred'k.	3	130.00	60	10.04	70,248	2,660,937	30,912	58	863,140	74	588	93,419½	931	97	372,597	01	31,844	55	1,235,637	75	City of Frederick.

The sixth Division does not include the cost of the 2 miles and 10 poles next west of the end of the 5th Division at the "Point of Rocks" and the 2 miles next east of the bridge at Harper's Ferry, graduated by the Chesapeake and Ohio Canal Company—and in the calculations of the average cost per pole, per mile, etc. those distances are not considered. Several sections of the first, and the whole of the second Division were graduated by the pole lineal. Their contents in cubic yards were estimated.

Division.	Graduation. Average cost per yard in cents and mills. of each Division.	Graduation. Average cost per yard in cents and mills. Of the whole Line.	Graduation. Average cost per mile. Of each Division. Dolls.	Cts.	Graduation. Average cost per mile. Of the whole Line. Dolls.	Cts.	Masonry. Average cost per perch. Of each Division. Dolls.	Cts.	Masonry. Average cost per perch. Of the whole Line. Dolls.	Cts.	Graduation and Masonry. Average cost per mile. Of each Division. Dolls.	Cts.	Graduation and Masonry. Average cost per mile. Of the whole Line. Dolls.	Cts.
City	29.9/10	29.9/10	18,995	20	18,995	20	6	19.4/10	6	19.4/10	36,120	53	36,120	53
First	32.04	31.89	30,368	08	29,193	91	4	61.8/10	4	74.23	47,531	50	46,354	81
Second	29.14	32.32	7,653	44	19,025	76	2	93.6/10	4	43.12	10,124	54	29,252	35
Third	30.4/10	31.14	6,598	72	13,909	68	2	40.9/10	4	18.68	7,692	33	20,376	18
Fourth	35.3/10	31.73	8,601	60	12,275	65	3	60.9/10	4	11.65	9,827	62	17,671	72
Fifth	31.3/10	31.68	7,118	40	11,449	39	2	36.9/10	4	00.45	8,211	38	16,128	84
Sixth	39.27	32.12	7,044	10	10,950	83	3	99.86	4	00.36	13,508	08	15,840	04
Lat. Road	44.00	32.43	8,075	20	10,870	37	1	58.5/10	3	98.84¼	9,348	85	15,561	58

(B—No. 4.)

A Statement, exhibiting of the several Sections, Divisions, and of the whole line of the Lateral Rail Road to Washington City—the names of the contractors and others by whom the several sections were graduated—the quantity of excavation and embankment on each section—the total quantity of earth handled on, and the actual cost of, each Section and Division, and the whole line. Accompanying the Sixth Annual Report of Caspar W. Wever, Superintendent. 1st October, 1835.

Designation of Division.	No. of Section.	Length in Poles.	Total length of each Division. Miles.	Poles.	Total distance from the Baltimore & Ohio Rail Road. Miles.	Poles.	Names of the Contractors and others.	Solids, Cubic yards. Excavation.	Embankment.	Price per yard in cents of the greater solid.	Amount of each contract. Dolls.	Cents	Cubic yards of earth handled. On each section.	On each Division.	Actual Cost. Of each section. Dolls.	Cents	Of each Division. Dolls.	Cents	Total cubic yards handled on, and total actual cost of, the whole line. Yards.	Cost. Dolls.	Cents	No. of Section.	Notes.	LOCALITY
First....	1	193.52	.	193.52	.	193.52	John M'Cartney,	40,452	.	.	36,072	37										1	*a*	This section deflects from the Baltimore and Ohio Rail Road to the North, then curves South, and crosses that road—it also × the Patapsco river on the "Thomas Viaduct."
.	.	.	.	.	.	.	B. Corachus,	.	136	.	33	00	49,588	49,588	36,106	27	36,106	27	49,588	36,106	27			
.	2	263.63	1	137.15	1	137.15	J. Scholfield and J. P. Cowman,	75,563	69,255	.	28,559	92												
.	.	.	.	.	.	.	John Miller,	8,403	.	50	4,201	50												
.	.	.	.	.	.	.	B. Cornelius and others,	2,726	.	.	810	70	86,694	136,282	33,581	12	69,687	39	136,282	69,087	39	2	*b*	× Turnpike to Washington, in the town of Elkridge Landing.
.	3	297.38	2	114.53	2	114.53	Jonathan Scholfield,	50,194	49,683	33	16,564	02												
.	.	.	.	.	.	.	William Flanagan,	3,890	.	25	972	50												
.	.	.	.	.	.	.	John Miller,	5,633	.	30	1,689	90	59,717	195,999	19,226	42	88,913	81	195,999	88,913	81	3	*c*	This section runs pretty nearly parrellel with, and North of the Messrs. Ellicott's furnace head race.
.	4	242.42	3	36.95	3	36.95	H. Stewart and W. Pote,	35,378	35,945	35	12,580	75												
.	.	.	.	.	.	.	John Miller,	1,003	.	30	324	90	46,948	242,947	12,905	65	101,819	46	242,947	101,819	46	4	*d*	This section passes West of Lamden's Paper Mill.
.	5	224.42	3	261.37	3	261.37	John Littlejohn,	33,555	43,084	33	14,514	72	43,984	286,931	14,514	72	116,334	18	286,931	116,334	18	5		This section × Budd's run.
.	6	325.75	4	267.12	4	267.12	John Littlejohn,	60,997	61,289	38	23,323	82												
.	.	.	.	.	.	.	John Miller,	2,143	.	30	602	90	63,432	350,363	23,966	72	140,300	90	350,363	140,300	90	6	*e*	This section × Deep run and ends near Mr. Allen Dorsey's house.
.	7	200.00	5	147.12	5	147.12	James Cain,	14,328	18,164	28	5,085	92	18,164	368,527	15,085	02	145,380	82	368,527	145,386	82	7		This section ends near Mr. John Miller's house.
Second.	1	767.43	2	127.43	7	274.55	Jonathan Jessop,	227,187	95,951	.	125,653	10												
.	.	.	.	.	.	.	James Giddings,	549	.	37½	205	90	270,236	270,230	125,859	00	125,859	00	638,703	271,245	82	1	*f*	This section runs through Elkridge and × Hammond's branch.
.	2	419.65	3	227.08	9	54.20	John W. Smith,	41,141	16,234	29	11,936	89												
.	.	.	.	.	.	.	James Giddings,	510	.	.	102	00	48,851	319,087	12,032	89	137,891	89	687,614	283,278	71	2	*g*	
.	3	254.79	4	161.87	9	308.09	Andw. Clements,	18,310	19,386	35	6,785	10	19,386	338,473	6,785	10	144,676	99	707,000	290,063	81	3		× the old Baltimore and Washington Road.
.	4	387.36	5	229.23	11	56.35	John Watson,	157,088	168,000	.	73,764	07												
.	.	.	.	.	.	.	Patrick M'Cormick,	12,545	1,450	52	6,523	40												
.	.	.	.	.	.	.	Peter Crickard,	3,853	.	23	899	19	220,386	558,859	81,186	60	225,863	65	927,380	371,250	47	4	*h*	× the Lesser Patuxent river and terminates in the middle of the Patuxent ridge.
.	5	101.60	0	310.83	12	137.95	John Watson,	300	7,598	.	2,279	40												
.	.	.	.	.	.	.	Tim. N. Farrell,	73,154	68,323	42½	31,090	45												
.	.	.	.	.	.	.	Patrick M'Cormick,	2,055	.	52	1,068	60												
.	.	.	.	.	.	.	James Giddings,	2,460	.	37½	940	75	150,323	709,182	35,379	20	261,242	85	1,077,709	406,629	67	5	*i*	× the Greater Patuxent river and terminates a short distance on the South side of it.
.	6	387.87	8	58.70	13	205.82	John D. Grove,	23,640	29,650	25	7,412	50	29,650	738,832	7,412	50	268,655	25	1,107,359	414,042	17	6		
.	7	290.00	9	29.60	14	176.72	David Lemmon,	41,293	15,109	24¾	10,220	02												
.	.	.	.	.	.	.	James Giddings,	.	.	.	100	.	41,693	780,525	10,320	02	278,975	37	1,149,052	424,362	19	7	*j*	
.	8	588.87	10	298.47	16	125.50	Trueman Belt,	213,368	15,602	.	78,472	88												
.	.	.	.	.	.	.	James Giddings,	28,092	1,000	.	10,912	30	241,460	1,021,985	89,385	18	368,360	55	1,390,512	513,747	37	8	*k*	× the Washington turnpike road, near Mr. Contie's house, and then runs through Snowden's ridge, called the "White Oak bottom."
Third..	1	604.20	1	284.20	18	89,79	Norman M'Farran,	31,044	31,988	27	8,636	76												
.	.	.	.	.	.	.	Thomas Cavana,	.	.	.	91	75	32,722	32,722	8,728	51	8,728	51	1,123,234	522,475	88	1	*l*	This section × the Washington turnpike and ends near it, near Belt's warehouse.
.	2	421.00	3	65.20	19	190.70	Hiram Howard,	12,102	17,838	19	3,389	22												
.	.	.	.	.	.	.	Thos. Cavana,	.	.	.	35	00	18,118	50,840	3,424	22	12,152	73	1,441,352	525,900	10	2	*m*	
.	3	206.06	3	271.26	20	76.85	Matthew Borland,	5,284	28,096	27	7,585	92	28,096	78,936	7,585	92	19,738	65	1,460,448	533,486	02	3		
.	4	575.07	5	206.33	22	111.92	James Cain,	27,290	27,833	34	9,463	22												
.	.	.	.	.	.	.	J. P. Cowman,	125	.	25	31	25	27,958	106,894	9,494	47	29,233	12	1,497,406	542,980	49	4	*n*	× Paint Branch and ends on its West branch.
.	5	321.21	6	207.54	23	13,13	Hugh Stewart,	12,156	12,322	30	3,696	60												
.	.	.	.	.	.	.	Thomas Cavana,	.	.	.	16	00	12,450	119,344	3,712	00	32,945	72	1,509,856	546,693	09	5	*o*	
.	6	455.30	8	22.84	24	148,43	Thomas C. Duvall,	17,816	18,421	23	4,236	83												
.	.	.	.	.	.	.	John P. Cowman,	1,107	.	25	276	75	19,528	138,872	4,513	58	37,459	30	1,529,384	551,206	67	6		× the Washington turnpike and ends immediately afterwards, about ½ mile North of Bladensburg.
Fourth.	1	404.30	1	84.30	25	232.75	Edward Dawes,	33,685	153,018	.	42,808	86												
.	.	.	.	.	.	.	Dennis M'Cormick,	.	.	.	100	.	159,418	159,418	42,908	86	42,908	86	1,688,802	594,115	53	1	*p*	This section crosses the North Western branch of the Eastern Branch, and ends near and North of Duel run.
	2	400.00	2	164.30	26	312.73	Trueman Belt,	208,583	33,541	.	47,003	55												
.	.	.	.	.	.	.	Thos. Canava and others,	.	.	.	813	97	212,134	371,552	47,817	52	90,726	38	1,900,936	041,933	05	2	*q*	× Duel run and × the District line.
	3	581.81	4	106.11	28	254.54	Trueman Belt,	61,089	20,226	25	15,272	25												
.	.	.	.	.	.	.	B. Cornelius,	.	.	.	38	10	61,216	432,768	15,310	35	106,030	73	1,962,152	657,243	40	3	*r*	Ends at the North line of the city of Washington.
City.. .	–	497.46	1	177.46	30	112.00	Trueman Belt,	15,349	28 904	25	7,226	00												
.	.	.	.	.	.	.	Gregory Ennis,	.	.	.	60	68	29,200	29,200	7,286	68	7,286	68	1,091,352	664,530	08		*s*	Ends at the North edge of the Pennsylvania Avenue on the West branch of Tiber creek.

NOTES.

a. Mr. M'Cartney removed 16,724½ yards of earth at 20 cents, and 32,727½ yards at 81. As the embankment was greatly the lesser quantity, it was not measured—the work done by Mr. Cornelius, is estimated.

b. Messrs. Scholfield & Cowman excavated 75,563 yards at 37½ cents, and embanked 1119 yards at 20 cents. Mr. Miller removed landslips last spring when the earth was in its worst possible condition. Mr. Cornelius and sundry other persons removed landslips by the job and by the day to the amount of $819.70, which, estimating the earth at 30 cents a yard, gives 2728 yards.

c. Messrs. Flanagan & Miller removed landslips.

d. The contractor supplied from without the limits of the road about 10,000 yards for the embankment at the end of the section, and discarded an equal quantity of the excavation at its beginning. Mr. Miller removed landslips.

e. 834 extra were allowed for the deposite of rubble stone at the foot of the embankment at Deep run for its protection. Mr. Miller removed landslips.

f. Mr. Jessop was the manager for the Company. Besides the excavation stated, it is estimated that there were removed at least 30,000 yards of landslips, whilst the earth was in its worst possible condition, and that about 12,500 yards of embankment at the end of the section, were procured from without the road-way limits; these two quantities are included in the "earth handled." Mr. Giddings subsequently removed a small landslip.

g. On this section about 7200 yards were procured from without the road limits, and is included in the "earth handled." Mr. Giddings cut bank ditches, &c. on this section to the amount of $102—510 yards are considered its equivalent.

h. Mr. Watson managed this section for the Company until his death. At his death there remained undone about 8000 yards of excavation and 1450 of embankment. The section originally contained 165,988 yards excavation, and 169,450 do. embankment. The differences are stated in the Table under their appropriate heads. Mr. Watson also removed about 1000 yards of landslips and supplied from without the road limits, to the embankment at the beginning of the section, about 45,000 yards. The quantity handled by him is then as follows, 165,988 — 8,000 + 1,000 + 45,000 = 203,988. Mr. M'Cormack, after the death of Mr. Watson, became the contractor for the removal of the remainder of the excavation and landslips. He removed 12,545 yards. Mr. P. Crickard removed 3,853 to widen the cut at its beginning, so as to afford a favorable junction to the Savage Rail Road. The whole quantity therefore handled on the section is 203,988 + 12,545 + 3,853 = 220,386 yards. 813 extra were allowed Mr. Crickard for depositing stone at the edge of the Lesser Patuxent river, for the security of the embankment.

i. Mr. Watson as manager for the Company commenced this section, and removed 300 yards of excavation, and formed 7,598 yards of embankment. It was subsequently let to Mr. T. N. Ferrell. Mr. Ferrell supplied from without the road-way limits, about 65,000 yards of embankment, and therefore nearly all the excavation was redundant. Mr. Giddings cut ditches valued at $16, and estimated at 80 yards. He also removed 2,466 yards of landslips, &c. as stated in the table. Patrick M'Cormick also removed 2,055 yards.

j. Mr. Giddings removed landslips for $100 by the job. It is estimated that he removed 400 yards.

k. Mr. Belt was the manager of this section for the Company. He prosecuted the work until all the excavation, with the exception of about 4000, and all the embankment, except about 1000 yards, were finished. It contained originally 217,308 yards of excavation, and 16,662 yards of embankment. If from these quantities be substracted what was left by Mr. Belt, it will be shown that he excavated 213,368, and embanked 15,602, as stated in the table. Mr. Giddings removed the remainder of the excavation, together with sundry landslips, amounting in all to 26,912 yards at 40 cents a yard—and 300 yards at 12½. He also cut by the job sundry bank ditches for $110, estimated at 880 yards. His account of quantity is then 26,912 + 300 + 880 = 28,092, amounting to the sum of $10,912.30.

l. Mr. Canava excavated a ditch, for which he was paid $91.75, estimated at 734 yards.

m. Mr. Canava also cut a ditch on this section, for which he was paid $35, estimated at 280 yards.

n. Mr. Cowman removed a landslip.

o. Mr. Canava opened ditches, &c. for which $16 was paid him, estimated at 128 yards.

p. Mr. Dawes embanked 152,817 yards at 28 cents, and 201 do. at 10 cents. Mr. Dawes discarded about 6000 yards of excavation, at the end of the section, and supplied an equal quantity at the beginning. His quantity is then 152,817 + 201 + 6000 = 159,018. Mr. M'Cormick removed, by the job, a landslip for $100, estimated at 400 yards.

q. Mr. Belt as contractor, removed 182,392 yards of excavation, and embanked 33,541 do. He also removed 4,760 yards of landslips, at 25 cents a yard—and excavated 1422 yards in bank ditches, at 15 cents a yard. He also supplied for the embankment at the beginning of the section about 20,000 yards. Messrs. Canava, Giddings, Cornelius and others, executed by the job, by the yard, and by the day, work to the amount of $813.97, estimated at 3,551 yards, in the removal of landslips.

r. Mr. Cornelius removed a landslip. Mr. Belt removed 50,774 of excavation and 1315 yards from bank ditches.

s. Mr. Ennis graded streets and cut bank ditches, for which he was paid $60.68, estimated at 296 yards.

An Exhibit of all the Masonry on the Lateral Railroad to Washington City, showing the names of the Contractors by whom it was constructed, its character, quantum and cost, by sections and divisions,—and on the whole line;—accompanying the sixth annual report of Caspar W. Wever, Superintendent. 1st October, 1835.

Designation of Division.	No. of Section.	Names of Contractors.	CULVERTS AND DETACHED WALLS. No. of Perches of 25 cubic ft.	Price per perch.	Cost on each section. Dolls.	Cts	Total No. of perches on each Div'n	Total cost on each Division. Dolls.	Cts	Total quantum and cost on the whole line. Quantum.	Cost. Dolls.	Cts	ARCHED OR BRIDGE MASONRY. No. of Vents.	Size of vents in feet.	No. of Perches of 25 cubic ft.	Price per perch.	Cost on each section. Dolls.	Cts	Total No. of perches on each Div'n	Total cost on each Division. Dolls.	Cts	Total quantum and cost on the whole line. Quantum.	Cost. Dolls.	Cts	Total quantum & cost of all kinds on each Division. Quantum	Cost. Dolls.	Cts	Total quantum and cost of all kinds on the whole line. Quantum.	Cost. Dolls.	Cts	No. of Section.	Notes.	LOCALITY.
First....	1	John M'Cartney,	2,832	.	13.976	31	2,832	13.976	31	2,832	13.976	31	8	58	19.602	.	128.260	20	19.602	128.260	20	19.602	128.260	20	26.434	142.236	51	26.434	142.236	51	1	*a*	This Bridge crosses the Patapsco river, and is called the "*Thomas Viaduct.*"
.	2	A. J. Douglass,	405	3.50	1.427	50	3,237	15.403	81	3.237	15.403	81	.	.	.	.	.	.	19.602	128.260	20	19.602	128.260	20	26.893	143.664	01	26.839	143.664	01	2	*b*	
.	3	A. J. Douglass,	454	4.20	1.906	80	3,691	17.310	01	3.691	17.310	01	.	.	.	.	.	.	19.602	128.260	20	19.602	128.260	20	27.293	145.570	81	27.293	145.570	81	3		
.	4	A. J. Douglass,	398½	4.50	1.793	25	4,089½	19.103	86	4,089½	19.103	86	.	.	.	.	.	.	19.602	128.260	20	19.602	128.260	20	27.691½	147.364	06	27.691½	147.364	06	4		
.	5	A. J. Douglass,	.	.	.	.	4,089½	19.103	86	4,089½	19.103	86	1	15	672½	7.50	5.011	87	20.274½	133.302	07	20.274½	133.302	07	28.363½	152.405	93	28.363½	152.405	93	5		× Budd's Run.
.	0	Charles Wilson,	.	.	.	.	.	.	.	.	.	.	1	11	787½	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		× County Road.
.	.	Charles Wilson,	69	4.25	293	25	4,158½	19.397	11	4,158½	19.397	11	1	18	1,524½	7.50	17.338	13	22.586	150.640	20	22.586	150.640	20	30.744½	170.037	31	30.744½	170.037	31	6		× Deep Creek.
.	7	Charles Wilson.	185½	4.25	789	44	4,344½	20.186	55	4,344½	20.186	55	.	.	.	.	.	.	.	.	.	22.586	150.640	20	30.930½	170.826	75	30.930½	170.826	75	7		
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		× Hammond's Branch.
Second.	1	Simon Frieze,	264½	4.25	1.125	18	264½	1.125	18	4.609	21.311	73	1	20	450½	7.00	3.153	50	.	.	.	.	.	.	715½	4.278	68	31.645½	175.105	43	1		
.	.	Charles Wilson,	152½	5.00	762	50	417½	1.887	68	4.761½	22.074	23	.	.	.	.	.	.	450½	3.153	50	23.036½	153.793	70	867¾	5.041	18	31.798	175.867	93	2		
.	2	Henry Marshall,	16	5.00	80	00	433½	2.029	93	4.829	22.310	48	.	.	.	.	.	.	450½	3.153	50	23.036½	153.793	70	935½	5.277	43	31.865½	176.104	18	3		
.	3	Andw. Clements,	67½	3.50	236	25	181½	2.123	93	4.829	22.310	48	.	.	.	.	.	.	450½	3.153	50	23.036½	153.793	70	1.335½	26.489	49	35.226	197.316	24	4		× The Lesser Patuxent River.
.	4	Simon Frieze,	18½	1.00	73	00	503	2.196	93	4.847½	22.383	48	1	50	3.382½	6.25	21.139	06	3.832¾	24.292	56	26.418¾	174.932	76	4.335½	26.489	49	35.226	197.316	24	4		× The Greater Patuxent River.
.	5	Charles Wilson,	.	.	.	.	503	2.196	93	4.847½	22.383	48	1	60	3.754½	7.50	28.456	87	7.587	52.749	43	30.173	203.389	63	8.090	54.946	36	39.020½	225.773	11	5	*c*	
.	6	Charles Wilson,	264	4.50	1.188	.	767	3.384	93	5.111½	23.571	48	.	.	.	.	.	.	7.587	52.749	43	30.173	203.389	63	8.354	56.134	36	39.284½	226.961	11	6		
.	7	David Lemon,	23	3.10	71	42	938¾	4.103	35	5.343	24.289	90	.	.	.	.	.	.	7.587	52.749	43	30.173	203.389	63	8.585¾	56.852	78	39.516	227.679	53	7		
.	8	Charles Wilson,	111	5.00	555	00	1,109¾	4.058	35	5.454	24.814	90	.	.	.	.	.	.	7.587	52.749	43	30.173	203.389	63	8.696¾	57.107	78	39.627	228.234	53	8		
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		× Piney Run, near Vansville.
Third..	1	Charles Wilson,	71¾	5.50	394	02	71¾	394	62	5.525¾	25.239	52	1	10	171½	10.75	1.843	62	.	.	.	.	.	.	243½	2.238	24	39.870½	230.472	77	1		
.	.	J. N. Mullican,	103½	5.00	816	25	235	1.210	87	5.689	26.055	77	.	.	.	.	.	.	171½	1.843	62	30.344½	205.233	25	406½	3.054	49	40.033½	231.289	02	2		
.	2	J. N. Mullican,	72	5.00	360	00	307	1.570	87	5.761	26.415	77	.	.	.	.	.	.	171½	1.843	62	30.344½	205.233	25	478½	3.414	49	40.105½	231.649	02	3		
.	3	J. N. Mullican,	72	5.00	360	00	307	1.570	87	5.761	26.415	77	.	.	.	.	.	.	171½	1.843	62	30.344½	205.233	25	634	4.191	99	40.261	232.426	52	4		
.	4	Nicholas L. Queen,	155½	5.00	777	50	462¾	2.318	37	5.916½	27.193	27	.	.	.	.	.	.	601¾	4.621	31	30.774¾	208.010	94	1.092½	7.082	08	40.719½	235.317	21	5	*d*	× The Paint Branch, near Rossburg.
.	5	Nicholas L. Queen,	28½	4.00	113	00	490¾	2.461	37	5.944½	27.306	27	5	25	430½	5.00	2.777	69	601¾	4.621	31	30.774¾	208.010	94	1.391¾	8.285	68	41.018¾	236.520	21	0	*e*	
.	0	Nicholas L. Queen,	299½	4.00	1.203	00	790	3.061	37	6.244	28.509	27	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		× Northwestern Branch of Eastern Branch, near Bladensburg.
Fourth.	1	Charles Wilson,	.	.	.	.	.	.	.	.	.	.	1	50	2.827½	8.00	22.620	00	2.827½	22.620	00	33.602¾	230.630	94	3.018½	23.431	75	44.037½	259.951	96	1		× Duel Run, near Bladensburg.
.	.	J. N. Mullican,	101	4.25	811	75	191	811	75	6.435	29.321	02	1	10	923¾	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		× Queen's Branch.
.	2	Charles Wilson,	.	.	.	.	.	.	.	.	.	.	1	8	403	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		
.	.	Charles Wilson,	.	.	.	.	.	.	.	.	.	.	.	.	.	6.00	7.978	50	4.157¼	30.598	50	34.932	238.609	44	4.348¼	31.410	25	45.367	267.930	46	2		× Pierson's Branch.
.	.	Trueman Belt,	134¾	4.00	539	00	325¾	1.350	75	6.569¾	29.860	02	1	10	162	6.00	972	.	.	.	.	.	.	.	.	.	.	.	.	.	.		
.	3	Charles Wilson,	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.319½	31.570	50	35.094	239.581	44	4.856	33.765	25	45.874¾	270.285	46	3		
.	.	Trueman Belt,	211	4.00	844	00	530¾	2.194	75	6.780¾	30.701	02	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		× The East Branch of Tiber Creek.
City....	–	Charles Wilson,	.	.	.	.	.	.	.	.	.	.	1	14	230	.	.	.	.	.	.	.	.	.	1.032	4.881	75	46.906¾	275.167	21	–	*f*	× Tiber Creek in 1st street West, in the City of Washington, and near the Capitol.
.	.	Charles Wilson,	369½	4.00	1.568	.	369½	1.568	.	7.150	32.272	02	2	15½	432¾	5.00	3.313	75	662¾	3.313	75	35.756¾	242.895	19									

Notes. *a.* The prices were different for the various kinds of work in the "Thomas Viaduct," and could not, therefore, be stated in this table. $6,000 is also included for 4000 perches of rubble stone, deposited around one of the abutments and some of the piers, for the greater security of their foundations.

b. $10 extra included.

c. $300 included for 200 perches of rubble stone deposited around the abutments for the security of their foundations.

d. The Bridge across Paint Branch, has a flat superstructure of wood, the cost of which was $626.44, and is included in the cost of the masonry.

e. $0 extra included.

f. $91 included for 70 perches of rubble stone, deposited along the wall on the west side of Tiber Creek, for the security of its foundation.

AN EXHIBIT of the Sections of the several Divisions of the Lateral Railroad to the City of Washington, showing their respective lengths, and the total distance of the termination of each, from a point near the ninth mile stone on the Baltimore and Ohio Railroad, the number of cubic yards of earth "handled," and perches of Masonry, and their cost respectively on each section, and on the whole line,—and also the aggregate cost of the Graduation and Masonry of each section, and of the whole line—accompanying the sixth annual report of CASPAR W. WEVER, Superintendent. 1st October, 1835.

Designation of the Division.	No. of Section.	Length of Section in Poles.	Total distance of the end of each section from the Balt. and O. R. R. Miles.	Total distance of the end of each section from the Balt. and O. R. R. Poles.	GRADUATION. Cubic yards of earth handled. On each section.	Cubic yards of earth handled. On the whole line.	Cost. On each section. Dolls.	C.	Cost. On the whole line. Dolls.	C.	MASONRY. Number of Perches of 25 cubic feet. On each section.	Number of Perches of 25 cubic feet. On the whole line.	Cost. On each section. Dolls.	C.	Cost. On the whole line. Dolls.	C.	Aggregate cost of Graduation and Masonry. Of each section. Dolls.	C.	Of the whole line. Dolls.	C.	LOCALITY.
First.....	1	193.52		193.52	49.588	49.588	36.106	27	36.106	27	26.434	26.432	142.236	51	142.236	51	178.342	78	178.342	78	Crosses the Patapsco river on the "Thomas Viaduct."
.	2	263.63	1	137.15	86.694	136.282	33.581	12	69.687	39	405	26.839	1.427	50	143.664	01	35.008	62	213.351	40	× Washington Turnpike in the town of Elkridge Landing.
.	3	297.38	2	114.53	59.717	195.999	19.226	42	88.913	81	454	27.293	1.906	30	145.570	81	21.133	22	234.484	62	Runs nearly parallel with the Messrs. Ellicotts furnace race.
.	4	242.42	3	36.95	46.948	242.947	12.905	65	101.819	46	398½	27.691½	1.793	25	147.364	06	14.698	90	249.183	52	Runs west of Lnmbden's Paper Mill.
.	5	224.42	3	261.37	43.984	286.931	14.514	72	116.334	18	672½	28.363½	5.041	87	152.405	93	19.556	59	268.740	11	× Budd's Run.
.	6	327.75	4	267.12	63.432	350.363	23.966	72	140.300	90	2.380½	30.744½	17.631	38	170.037	31	41.598	10	310.338	21	× Deep Run, near Allen Dorsey's house.
.	7	200.00	5	147.12	18.164	368.527	5.083	92	145.386	82	185½	30.930½	789	44	170.826	75	5.875	36	316.213	57	Ends near John Miller's house.
Second....	1	767.43	7	274.55	270.236	638.763	125.859	00	271.245	82	715¼	31.645½	4.278	68	175.105	43	130.137	68	446.351	25	Run's through Elkridge and × Hammond's Branch.
.	2	419.65	9	54.20	48.851	687.614	12.033	89	283.278	71	152½	31.798	762	50	175.867	93	12.795	39	459.146	64	× The road from the Savage Factory to Annapolis.
.	3	254.79	9	308.99	19.386	707.000	6.785	10	290.063	81	67½	31.865½	236	25	176.104	18	7.021	35	466.167	99	× The old road from Baltimore to Washington.
.	4	387.36	11	56.35	220.386	927.386	81.186	66	371.250	47	3.400½	35.266	21.212	06	197.316	24	102.398	72	568.566	71	× The Lesser Patuxent river, and ends in the centre of Patuxent Ridge,
.	5	401.60	12	137.95	150.323	1.077.909	35.379	20	406.629	67	3.754¼	39.020½	28.456	87	225.773	11	63.836	07	632.403	78	× The Greater Patuxent river, and ends near the half way house, on the Wash. Turnpike.
.	6	387.87	13	205.82	29.650	1.107.559	7.412	50	414.042	17	264	39.284¼	1.188	00	226.961	11	8.600	50	641.003	28	× The road from Johnson's Factory to Annapolis.
.	7	290.90	14	176.72	41.693	1.149.052	10.320	02	424.362	19	231¾	39.516	718	42	227.679	53	11.038	44	652.041	72	Ends near Contee's Brick house.
.	8	588.87	16	125.59	241.460	1.390.512	89.385	18	513.747	37	111	39.627	555	00	228.234	53	89.940	18	741.981	90	× The Washington Turnpike and runs through Soowden's Ridge.
Third.....	1	604.20	18	89.79	32.722	1.423.234	8.728	51	522.475	38	243½	39.870¼	2.238	24	230.472	77	10.966	75	752.984	65	× The Washiagton Turnpike near Vansville.
.	2	421.00	19	190.79	18.118	1.441.352	3.424	22	525.900	10	163½	40.033½	816	28	231.289	02	4.240	47	757.189	12	Runs through the lands of T. Belt and Dr. Culver.
.	3	206.00	20	76.85	28.096	1.469.488	7.585	92	533.486	02	72	40.105½	360	00	231.649	02	7.945	92	765.135	04	Ends near Mr. John Prother's house.
.	4	575.07	22	111.92	27.958	1.497.406	9.494	47	542.980	49	155½	40.261	777	50	232.426	52	10.271	97	775.407	01	× Near its end Paint Branch—superstructure of the Bridge of wood.
.	5	321.21	23	13.13	12.450	1.509.856	3.712	60	546.693	09	458½	40.719½	2.890	69	235.317	21	6.603	29	782.010	30	Runs through the lands of Mr. George Calvert.
.	6	455.30	24	148.43	19.528	1.529.384	4.513	58	551.206	67	299¼	41.018¾	1.203	00	236.520	21	5.716	58	787.726	88	× The Washington Turnpike, and ends immediately afterwards.
Fourth....	1	404.30	25	232.75	159.418	1.688.802	42.908	86	594.115	53	3.018½	44.037½	23.431	75	259.951	96	66.340	61	854.067	49	× The Northwestern Branch, near Bladensburg.
.	2	400.00	26	312.73	212.134	1.900.936	47.817	52	641.933	05	1.464½	45.367	8.517	50	267.930	46	56.335	02	910.402	51	× Duel Run and the north line of the District of Columbia.
.	3	581.81	28	254.54	61.216	1.962.152	15.310	35	657.243	40	373	45.874¾	1.816	00	270.285	46	17.126	35	927.528	86	Ends at the north boundary of Washington City.
City.....	–	497.46	30	112.00	29.200	1.991.352	7.286	68	664.530	08	1.032	46.906¾	4.881	75	275.167	21	12.168	43	939.697	29	× Tiber Creek and ends at the North edge of Pennsylvania Avenue, on the west bank of the Tiber.

RECAPITULATION.

Designation of the Division.	Length of each Division. Miles.	Length of each Division. Poles.	Total dist'ce of the end of each Divis'n from the B. & O. Railroad. Miles.	Total dist'ce of the end of each Divis'n from the B. & O. Railroad. Poles.	GRADUATION. Cubic yards of earth handled. On each Division.	Cubic yards of earth handled. On the whole line	Cost. Of each Division. Dolls.	C.	Cost. Of the whole line. Dolls.	C.	MASONRY. Number of perches of 25 cubic feet. On each Divis'n.	Number of perches of 25 cubic feet. On the whl'e lin	Cost. Of each Division. Dolls.	C.	Cost. Of the whole line. Dolls.	C.	Aggregate cost of Graduation & Mason'y Of each Division. Dolls.	C.	Of the whole line. Dolls.	C.	Termioation of the Divisioos.
First....	5	147.12	5	147.12	368.527	368.527	145.386	82	145.386	82	30.930½	30.930½	170.826	75	170.826	75	316.213	57	316.213	57	Near John Miller's house.
Second	10	298.47	16	125.59	1.021.985	1.390.512	368.360	55	513.747	37	8.696¾	39.627	57.407	78	228.234	53	425.768	33	741.981	90	Near Mr. Agnew's brick house.
Third..	8	22.84	24	148.43	138.872	1.529.384	37.459	30	551.200	67	1.391½	41.018¾	8.285	68	236.520	21	45.744	98	787.726	88	Near and North of Bladensburg.
Fourth	4	106.11	28	254.54	432.768	1.962.152	106.030	73	657.243	40	4.856	45.874¾	33.765	25	270.285	46	139.801	98	927.528	86	North boundary of Washington City.
City....	1	177.46	30	112.00	29.200	1.991.352	7.286	68	664.530	08	1.032	46.906¾	4.881	75	275.167	21	12.168	43	939.697	29	North edge of Pennsa. Avenue, at the foot of Capitol Hill.

Division.	GRADUATION. Average cost per yard in cents and mills. Of each Divisioa.	Average cost per yard in cents and mills. Of the whole line.	Average cost per mile. Of each Divisioa Dolls.	C.	Average cost per mile. Of the whole linc. Dolls.	C.	MASONRY. Average cost per perch. Of each Division. Dolls.	Cts.	Average cost per perch. Of the whole line. Dolls.	Cts.	GRADUATION AND MASONRY. Average cost per mile. Of each Division. Dolls.	Cts.	Average cost per mile. Of the whole line. Dolls.	Cts.
First....	39.45	39.45	26.628	84	26.628	84	5	52.29	5	52.29	57.917	22	57.917	22
Second	30.04	36.94	33.693	40	31.340	45	6	60.10	5	75.95	38.944	41	45.263	58
Third..	26.97	36.04	4.641	00	22.531	48	5	95.34	5	76.61	5.667	55	32.199	63
Fourth	24.50	33.40	24.479	84	22.824	56	6	95.33	5	89.18	32.274	95	32.210	96
City.....	24.95	33.37	4.687	28	21.895	55	4	73.03	5	86.62	7.827	55	30.962	02

[S.]

BALTIMORE, 26th SEPT., 1833.

Sir,—In compliance with your instructions I have taken into consideration the propriety of causing the graduation of the heavy section (*8th) of the First Division of the Washington Railroad to be executed under the immediate direction of agents of the Company, instead of the customary mode by contract, and recommend it as the most proper course.

It is believed that the graduation of this section, under the most judicious management and in the absence of the occurrence of extraordinary difficulties, such as iron ore, quicksands, landslips, &c. cannot be effected at a cost less than from eighty to ninety thousand dollars. Very few of such persons as are disposed to become contractors, or such as now are contractors on public works, are in the possession of such amount of funds as are indispensably necessary for the advantageous commencement and prosecution of a work of this magnitude, and the insufficiency of means is not unfrequently the cause of failure, even where the price is ample and the management good. But this section is, from appearances, so very liable to the occurrence of extraordinary difficulties, such as are above alluded to, that no prudent contractor will undertake its graduation without adding to his price such sum as will, in his opinion, indemnify him for the risk. If he does not do this, and any or all of those apprehended difficulties should be met with, his price will, of course, prove greatly inadequate to the completion of the work and he must abandon it. The company by placing this work under contract cannot gain under any circumstances, but most probably will lose. They cannot gain by having the work done with the funds of contractors, (and in this way I am sure it is not their wish to gain) because if the contractor has an inadequate price, and although he may be in possession of the requisite funds, he will not, most probably, expend them for the benefit of the company and to the ruin of himself; and if his price is based upon the expectation of great difficulties, and those difficulties should not occur at all, or only in part, then his price will be too high, and the company will be the loser. And again, if his price is adequate and his funds inadequate he will most likely fail: or if his price and funds are both adequate and greater difficulties should occur than he expected a failure must be the consequence.

*Note —This section was subsequently joined to the 1st section of the 2d division and both then called the 1st section of the 2d division.

Failures are greatly to be deprecated, especially in the commencement of a great work, and every possible precaution ought to be taken to prevent them. Their occurrence is highly prejudicial to the interests of the Company and of every one employed by them, because they occasion distrust, riot, and consequent embarrassment, if not great injury to other contractors. The uncertainty of payment causes an advance in the price of every article of value and in none perhaps, more, than in that of labor. And if the credit of the line sustains in its commencement such a shock, as would be produced by a failure on this section, it can scarcely be expected to recover from it before the work shall have been finished, and the Company must in the mean time pay the premium or advance in the price of labor occasioned by it.— It will then be perceived that the baneful consequences of a failure on this section, may not be confined to it alone, but will pervade the whole line of road. And in the event of failure the Company will be compelled either to undertake the section themselves, or again place it under contract most likely at an advanced price, and with very little certainty that the succeeding contractor will finish it. And finally, after encountering all the moral disadvantages of several failures, to pay vastly more than the original value of the work. For these reasons and others which might be named, I would respectfully recommend to the consideration of the President and Directors the propriety of conducting the graduation of this section, by agents of the Company. For this purpose a principal agent or manager to be selected by the President and Directors, and to be under the direction of the Superintendent of Graduation and Masonry, will be necessary. This agent should be a man of integrity, fidelity, capacity, and of great energy. The minute details of the work as well as the selection of the necessary subordinate agents, should be confided to him, as he alone will be held responsible for the judicious and economical execution of the work. The general outlines of the operations and system of accountability will be prescribed by the Superintendent of Graduation and Masonry, whose duty it will also be to see that the principal agent or manager conducts the work, in all its parts, advantageously.

If the President and Directors should concur with me in the opinion that the 8th section of the 1st division should be placed under the direct management of agents of the Company, I would then respectfully but earnestly, further recommend, for the same reasons, that two other sections be also graduated by the Company. Indeed, there will be additional reasons for undertaking the other two difficult and expensive sections. At any time that an increased force might be temporarily required on any one section, it could be supplied from one or both of the other sections. Besides the correct management by the Company, of sections, on different parts of the line would exert a powerful moral influ ence upon the conduct of those employed on the whole line,

very highly beneficial both to the interests of the Company, the contractors and laborers.

In the event of those sections being conducted, as recommended, I would very respectfully, suggest that if the provisions of the charter justify the measure, and the President and Directors approve it, that the establishment of stores by the Company, at those sections respectively, would prove beneficial both to the interests of the Company and those employed by it. The Company would, of course, sell to their operatives at very moderate profits, and whilst they would thus advance their own interests would also subserve the interests of those in their employment, by selling to them necessary articles at fair prices and at convenient places, by which they would be saved from loss of time and perhaps from imposition. The superintendency of these establishments would, of course, devolve upon some other officer of the Company than the Superintendent of Graduation and Masonry, whose time would be too much otherwise occupied to attend to them. The establishment of stores which will be conducted on correct principles, and which will save both time and money to the laborers and others in the service of the Company, is considered of so much importance, that I would recommend that the President and Directors should, in the event of their declining to establish them by the Company, afford every practicable facility to such persons as will establish them and conduct them on correct principles.

To such men as are suitable for agents,—men of character,—of long tried integrity, of capacity and great industry, adequate compensation must be given, or their services cannot be commanded: and unless such can be obtained it would be more advisable to encounter all the hazards, perplexities and difficulties likely to grow out of contracts for such expensive jobs.

From the preceding remarks I do not wish it to be inferred that I am against contracting altogether. I am decidedly in favor of contracting in general, and would only make exceptions in cases of very large extent or in such as it is beyond the capacity of man to form a correct estimate of the value of the work to be done, because of threatened or expected difficulties that may or may not occur.

In conclusion I would respectfully remark, that I conceive it to be highly important, that those sections should be in progress of construction as early as practicable.

I am sir, yours very respectfully,

CASPAR W. WEVER.

To Philip E. Thomas, Esq.
President of the Baltimore and Ohio Railroad Company.

[T.]

To Contractors.

The Graduation is to be finished at the times stated in the following exhibit, and in the manner described in the printed blank articles of agreement.

The price proposed per yard for the excavation or embankment, as the one or the other, is the greater in quantity, is to be in full for all the work of every kind, necessary to effect the graduation of the section, viz. grubbing, clearing, excavating, embanking, &c.

No ardent spirits to be kept or used on or near the work.

Such as intend proposing, are earnestly requested to give the ground a strict examination, as no extra allowance will be made for rock, hard earth, iron ore, or any other substance which may be met with in the excavations: nor for the occurrence of of any unforeseen or unexpected difficulty, such as water, quicksands, &c. &c. except landslips in some cases. The removal of such landslips as may occur on sections where the excavation is the greater solid, will be paid for, at the price of the section, provided they be removed to such place or places as may be designated by the superintending agent. Such as may occur on sections where the embankment is the greater solid, shall be used in the embankment, for which no extra allowance will be made; but the removal of such portions as may be redundant, will be paid for, at the price of the section, provided they be deposited at such point or points as may be directed by the superintending agent.

Copartnerships have been found vexatious. If two or more persons interested in a bid, one only will bid, and he alone will be acknowledged as the contractor, if the proposal should be accepted.

The proposals will inclose the recommendations of the proposers, be sealed up, endorsed with the name of the proposer and the words "*Proposals for Graduation;*" and directed to the subscriber. They may be left on or before the 20th instant, either at the office of the subscriber in Baltimore, at the tavern of Mr. Merrill on Elk Ridge, or at that of Mr. Drummond, Vansville.

Those whose bids may be accepted by the President and Directors, will be advised by letter without delay, as the work must be actively commenced on or before the 1st of January, 1834.

CASPAR W. WEVER,

November 10, 1833. SUPERINTENDENT.

An Exhibit

Of the number and length of the sections of the Second and Third, and part of the Fourth Divisions of the Lateral Rail Road to Washington City, and the quantum of excavation and embankment on each; and also the time when the graduation of each is required to be completed. It is to be understood that the excavation may be increased or diminished by a change in the slopes of the banks, or by other causes.

No. of Division.	No. of Section.	Station of Commencement.	Station of Termination.	Length of section in feet.	Cubic Yards of Excavation.	Cubic Yards of Embankment.	When to be completed.
2	*1	356	420	6370	18,187	59,951	1st October, 1834.
"	2	420	489	6924	41,141	16,234	1st September, 1834.
"	3	489	531	4204	18,340	19,327	1st May, 1834.
"	*4	531	595	6375	165,988	169,450	1st May, 1835.
"	*5	595	661	6610	73,454	75,921	1st November, 1834.
"	6	661	725	6400	23,640	29,650	1st June, 1834.
"	7	725	773	4800	41,293	15,109	1st September, 1834.
"	*8	773	870	9700	217,368	16,662	1st July, 1835.
3	1	870	970	10,000	31,044	32,129	1st July, 1834.
"	2	970	1040	6974	12,102	17,791	1st May, 1834.
"	3	1040	1074	3400	5,284	28,121	1st June, 1834.
"	4	1074	1169	9525	27,290	27,753	1st June, 1834.
"	5	1169	1222	5300	13,281	13,194	1st May, 1834.
"	6	1222	1314	7529	25,570	25,570	1st June, 1834.
4	1	1314	1381	6700	33,685	159,021	1st June, 1835.

*The 1st, 4th, 5th and 8th sections of the 2d Division, will be graduated by the Company; but proposals will be received for the 8th section.

Disposition of Materials.

1*st Section* 2*d Division.*—The embankment from No. 370 to No. 396, amounts to 9,696 yards. This embankment will be supplied from the adjacent excavation, as far back as to near No. 360. It will be hauled in carts, (except what is thrown up from the ditches) an average distance of 2400 feet. The remainder of the embankment across Chandler's Run bottom, consisting of 50,255 yards, will be supplied (excepting 61 yards at the end of the section) from the excavation of the Deep Cut through Merrill's Ridge, as far back as a little back of No. 349—The average distance to which this mass of 50,194 yards of earth will be removed, is 5500 feet, on a level. Distance through timber land, 99 rods.

2*d Section* 2*d Division.*—2755 yards of excavation from No. 420 to No. 431, to be hauled 400 feet to make the embankment as far as a point a little ahead of No. 427—1955 yards of excavation from No. 436 to No. 444, to be applied to the embankments ahead and back of the cutting between those numbers—haul 400 feet. The remaining embankment, as far as No. 456, is in amount 10,567 yards, and will be supplied from the excavation ahead of No. 454. The average distance of transportation, will be 2400 feet. The remainder of the excavation upon this section, to No. 489, amounts to 25,864 yards, of which 957 yards will be applied to the embankment between Nos. 478 and 489—the rest will be deposited in spoil banks, in the nearest convenient places, with an average haul assumed at 1000 feet. Distance through woodland = 140 rods.

3*d Section* 2*d Division.*—4912 yards of embankment, between Nos. 501 and 513, to be supplied from the excavation back of it to between Nos. 498 and 499—haul 800 feet forward. 8651 yards of excavation back of the excavation just mentioned, to the beginning of the section, to be hauled forward to the embankment ahead of No. 517, an average distance of 3300 feet—4777 yards of excavation still remaining on the section from No. 511 to No. 526, to be transported forward to the embankment near the end of the section, an average distance of 1600 feet—987 yards of embankment to No. 531, still to be supplied from neighboring grounds—haul 600 feet. Distance through woodland, 25 rods.

4*th Section* 2*d Division.*—The embankment upon this section is in one mass, extending over the valley of the Lesser Patuxent; its amount is 169,450 yards—in the excavation through the ridge between the two Patuxents, as far as to No. 595, the end of the section, there are 165,988 yards. The difference between

these quantities, viz: 3462 yards, will be supplied by a small enlargement of that excavation. The earth will be transported from the cutting to the filling—an average distance of 4200 feet. Distance through woodland, = 182 rods.

5th Section 2d Division.—The embankment from No. 617 to No. 637, is 10,766 yards, and will be supplied from the excavation back of it as far as a point between Nos. 607 and 608—it will be hauled in carts an average distance of 1800 feet. The excavation from the beginning of the section to the point last mentioned, is 62,688 yards, and will make the embankment beyond No. 637, as far as a point a little ahead of No. 659; southwest of the greater Patuxent. The transportation will be an average distance of 5200 feet. There remains upon the section at the end of it, 2467 yards, to be supplied from the adjacent earth not excavated for the road—haul assumed at 500 feet.—Distance through timber land, 250 rods.

6th Section 2d Division.—The excavation between Nos.676 and 679, is 2284 yards, and will be hauled back to the embankment adjoining it, which it will supply to a point between Nos. 668 and 669—average haul 600 feet. The remaining excavation to No. 688, amounting to 11,541 yards, will be hauled forward to the embankment ahead of No. 687, supplying it to a point between Nos. 692 and 693—average haul = 700 feet. The excavation between No. 697 and No. 725, is 9815 yards, and will be hauled back to the embankment back of No. 698, an average distance of 1900 feet. There remains from No. 661, onwards to a point between Nos. 668 and 669—5578 yards of embankment to be supplied from the sides of the road, and other convenient sources, with an average haul assumed at 1000 feet. 432 yards of the embankment between Nos. 687 and 698, remains to be supplied from the sides of the road, in the cutting ahead of No. 697—haul = 500 feet. No timber on this section.

7th Section 2d Division.—The embankment from 725 to No. 737, is 2724 yards, to be supplied from the excavation adjacent to it, as far as a little back of No. 740—haul back = 500 feet. The embankment remaining on the section, and lying principally between Nos. 763 and 773, is 12,385 yards, and will be furnished from its adjoining excavations, absorbing the cutting back of No. 764, as far as a point a little back of No. 757—average haul, 900 feet. The excavation remaining upon the section between Nos. 740 and 757, amounts to 26,184 yards, and will be redundant—to be deposited in spoil banks, within an average distance of 800 feet. Distance through timber land = 73 rods.

8th Section 2d Division.—Embankment from No. 773 to No. 782= 6043 yards, supplied from the contiguous cuttings, as far as No. 786, with an average haul of 800 feet. Embankment from No. 848 to 870 = 10,619 yards, to be supplied from the excavation between Nos. 853 and 859, and from the excavation back of No. 850, as far back as to near No 836—average distance of transportation 2000 feet. 200,706 yards of redundant excavation, between Nos. 785 and 836, to be thrown up in spoil banks, on each side of the cut—average haul assumed at 1500 feet, horizontal distance. Distance through timber land = 217 rods.

1st Section 3d Division.—The excavation from No 870 to 893, is in amount 15,383 yards, to be hauled forward for the supply of the embankment, as far as a point a little in advance of No. 908—average transportation, 2600 feet. 4640 yards of embankment remains to No. 914, to be furnished by the excavation ahead of No. 912, on to near No. 919—average haul *back*, 600 feet. 5957 yards of excavation remaining to No. 930, to be hauled forward to the embankment ahead, supplying it to a point between Nos. 934 and 5—distance 1000 feet. 6149 yards of embankment from the point last mentioned, to No. 963; of which 5064 yards will be supplied from the excavations between Nos. 942 and 5, and Nos. 962 and 70—average distance 800 feet. The remainder of the 6149 yards, viz. 1085 yards near No. 935, will be furnished from the sides of the road, at an average distance of 600 feet. Timbered land, 100 rods.

2d Section 3d Division.—Embankment between No. 973 and 7= 930 yards, supplied from contiguous cuttings—distance of transportation, 400 feet. Excavation remaining to No. 992 = 6065 yards to be hauled forward, making the embankment ahead to a little ahead of No. 997—haul = 1100 feet. 3900 yards of embankment remaining to No. 1008, of which 595 yards will be furnished by the excavation to the same No.; and the residue, viz. 3305 yards will be procured from the point of hill touched by the line at No. 1005—average haul for the whole, 3900 yards = 800 feet. Remaining excavation to No. 1013 = 1429 yards, to be hauled forward 400 feet, supplying the embankment ahead of No. 1012 to near No. 1016. 4856 yards of embankment still remaining to 1025; of which 2472 yards will be furnished from the excavation ahead of No. 1024 to near No. 1031, and the residue will be brought from the sides of the road in that cutting—average haul for the whole = 1100 feet. The excavation and embankment to the end of the section, balance each other, being each 611 yards, to be hauled 500 feet. No timber.

3d Section 3d Division.—Excavation from No. 1040 to No. 1053 = 5284 yards, supplying the embankment ahead of No. 1052, to a point between Nos. 1062 and 3—average haul forward = 1300 feet. 22,837 yards of embankment remaining upon the section to No. 1074, to be procured from an enlargement of the cutting just mentioned, and other ground at the sides of the road, with an average haul of say 1700 feet. No timber.

4th Section 3d Division.—Embankment = 9077 yards from No. 1074 to No. 1098, to be hauled *back* from the excavation ahead of No. 1096 to near No. 1109—average distance 2300 feet. 6782 yards of excavation still left to No. 1114, to be hauled forward, making the embankment from No. 1113 to near No. 1126—average distance = 1000 feet. 8427 yards of embankment still remaining to No. 1148, to be supplied by the excavation from No. 1141 to near No. 1160—average haul *back* = 1700 feet. 2004 yards of excavatien left to No. 1165, to be hauled forward, supplying the adjacent embankment to a point between No. 1168 and 9—distance 500 feet. 463 yards of embankment remaining to the end of the section, to be brought from sources, within a distance of say 400 feet. Timber 228 rods.

5th Section 3d Division.—Embankment from No. 1169 to No. 1195 = 12,664 yards, to be supplied from the excavation ahead of No. 1190 to near No. 1216—average haul *back* = 2000 feet. To the end of the section, there are 617 yards of excavation, and 530 yards of embankment, which may be considered as balancing each other. The 617 yards to be hauled 2000 feet. Timber, 132 rods.

6th Section 3d Division.—Embankment from No. 1231 to No. 1248 = 7539 yards, of which 2682 yards will come from the excavation back of No. 1239, with a haul of 1300 feet.—The residue equal 4857 yards, will be furnished by the excavation ahead of No. 1245 to near No. 1262. Average haul back = 1200 feet. The excavations from No. 1262 to No. 1314, the end of the section and division, amount to 18,031 yards, and will balance the embankments to the same point, with an average haul for the whole mass, of 800 feet. No timber. It is expected that the vertical position of this section may be slightly changed.

1st Section 4th Division.—From No. 1314 to No. 1333, excavation 1870 yards, to be applied to the contiguous embankments, supplying them to a point between Nos. 1333 and 4—haul 1000 feet. 31,815 yards of excavation from No. 1368 to No. 1381. hauled back to a little behind No. 1351—average

distance 2000 feet. 115,336 yards of embankment across the valley of N. West Branch, opposite Bladensburgh, still remaining to be supplied from the bluff ground on each side of its two terminations, with an average haul of 1500 feet.

The end of the 1st section 4th division, is within 5 or 600 feet of the northern line of the District of Columbia.

Proposal.

I will graduate the following sections of the Second, Third and Fourth Divisions of the Lateral Railroad to Washington City, at the prices set opposite them respectively.

No. of Division.	No. of Section.	Price per cubic yard, in cents.
2	2	
	3	
	6	
	7	
	8	

No. of Division.	No. of Section.	Price per cubic yard, in cents.
3	1	
	2	
	3	
	4	
	5	
	6	
4	1	

And I will complete said Sections satisfactorily, on or before the times set to them respectively, in the preceding Exhibit.—The name of my nearest Post Office, is county of and state of

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[U.]

To Contractors.

All the masonry in the bridges shall be of a rubble character, excepting the face work of the abutments, and the sheeting of the arches, and coping, and shall be well laid in good mortar.

The faces of the abutments shall be rough in their exterior, but the stone shall be ranged, dressed bed and top, and have vertical joints. The sheeting stone shall be cut or shaped so as to range transversely of the arch, and conform to the radii of the circle or circles of which the arch may be a segment, and rustic in their exterior.

The coping must be three feet in width, one foot in thickness, beds and tops parrallel, and ends square, and their outer edge rustic. No parapet walls will be required.

The culverts will be of dry rubble masonry, of the best quality;—the bottom of the vents will be flagged, or paved, and the tops covered with stone, at least one foot and a half longer than the vent is wide:

The right is reserved to the Baltimore and Ohio Railroad Company, acting by the Superintendent of the work, to dispense with any of the designated culverts or bridges, to modify their dimensions, or to substitute culverts for bridges.

The actual quantity of perches in each structure may vary from the estimate, as the estimate is based upon certain depths of foundation, and dimensions of parts, which it may be found necessary to increase or diminish.

The bid as made by the perch, must cover every expense incurred in the construction of the masonry proposed for, such for instance, as the cost of the stone, sand, lime, centres, excavations of foundations, &c. &c. as well as the actual workmanship.

No extra allowance will be made in any contingency.

For a more particular description of the manner of executing the masonry, bidders are referred to the printed articles of agreement.

The culverts must be completed by the 1st April, 1834, and the bridges of a chord up to 20 feet, on or before the 1st of June 1834, and those of a chord greater than 20 feet, on or before the 1st of October, 1834, except that over Paint Branch, on the 4th section, 3d division, which must be completed by the 1st of July, 1834.

No ardent spirits to be kept or used on or near the work.

Contractors will be considered as entitled to the stone nearest the sections, on which their masonry is to be erected, unless the Superintending Agent of the work should otherwise direct.

Copartnerships have been found vexatious. If two or more persons wish to be interested on the same work, one, only, will propose, and he alone will be regarded as the contractor, if his proposal should be accepted.

The proposals will enclose the recommendations of the proposers, be sealed up, endorsed "*Proposals for Masonry*," and directed to the subscriber. They may be left on or before the 20th instant, either at the office of the subscriber, in Baltimore, or at the tavern of Mr. Merrill, on Elk Ridge, or at that of Mr. Drummond, Vansville.

Those whose bids may be accepted by the President and Directors, will be advised by letter without delay, as the work must be vigorously commenced on or before the first day of January, 1834.

CASPAR W. WEVER, *Superintendent.*

November 10, 1833.

Description.

An estimated quantum of the masonry required on the second, third, and part of the fourth divisions of the Lateral Railroad to Washington City.

Road Sections. No. of divisions.	Number of sections.	Station of commencement.	Station of termination.	Number of the station the work is near.	Height of road above stream or drain.	Character of structure, whether bridge or culvert.	Number of arches or vents.	Span of each arch or dimension of each vent.	Estimated number of perches at 25 cubic feet.	When to be completed.	Remarks.
2d	1st	356	420	402 or 412	17	bridge.	1	20	550	1st June, 1834	Chandler's branch.
"		420	489	427	13	culvert.	1	3 by 4	94		Near Whites'.
"	2d	"	"	432-3	10.7	culvert.	1	2 by 2	46		
"	"	"	"	453	8.8	culvert.	1	2 by 3	58	1st April, 1834	
"	"	"	"	479	2.8	culvert.	1	2 by 2	26		
"	3d	479	531	503	6.3	culvert.	1	2 by 3	50		Near T. Snowdens' farm house.
	"	"	"	501	8	culvert.	1	2 by 2	38	1st April, 1834	
"	4th	531	595	552	38	bridge.	1	50	4500	1st Oct. 1834.	Little Patuxent.
	"	"	"	571	cut 1.3	culvert.	1	3 by 2	23	1st April, 1834.	
"	5th	595	661	656	33.8	bridge.	1	60	5000	1st Oct. 1834.	Great Patuxent.
"	6th	661	625	691	19.5	culvert.	3	3 by 6	421	1st April, 1834.	Snowden's branch.
"	7th	725	773	726	3.2	culvert.	1	2 by 2	27		
"	"	"	"	735	6.2	culvert.	1	2 by 3	49		
"	"	"	"	751	1.3	culvert.	2	3 by 2	37	1st April, 1834	
"	"	"	"	767	14	culvert.	1	3 by 6	147		
"	8th	773	870	774	9	culvert.	1	2 by 3	59		
"	"	"	"	867	5	culvert.	2	3 by 4	200	1st April, 1834	
								Total.	11325		
3d	1	870	970	934	7.8	bridge.	1	10	200	1st June, 1834	Mid.b. of Piney r.
"	"	"	"	961	5.5	culvert.	3	3by 5	250	1st April, 1824	S.br. of Piney run.
"	2	970	1040	975	4.5	culvert.	1	2 by 2	30		
	"	"	"	981	0.5	culvert.	1	2 by 2	20		
	"	"	"	997	13.3	culvert.	1	3 by 4	111	1st April, 1834	
	"	"	"	1019	7.3	culvert.	1	3 by 4	66		
	"	"	"	1038	1.5	culvert.	1	2 by 2	23		
"	3	1040	1090	1067	14.8	culvert.	1	3 by 3	101		
	"	"	"	1080	7.5	culvert.	1	2 by 3	54	1st April, 1834	
"	4	1090	1175	1142	6.	culvert.	1	3 by 4	61	1st April, 1834	
	"	"	"	1170	6.9	bridge.	2	50	365	1st July, 1834	*Paint branch.
"	5	1175	1223	1221	2.	culvert.	1	2 by 2	24	1st April 1834	
"	6	1223	1314	1244	10.3	culvert.	2	3 by 4	123		Calvert's branch.
	"	"	"	1274	11.	culvert.	1	2 by 2	47		
	"	"	"	1279	6.	culvert.	1	2 by 2	34		
	"	"	"	1284	8.3	culvert.	1	2 by 2	39		
	"	"	"	1299	19.	culvert.	1	2 by 3	126	1st April, 1834	
	"	"	"	1305	7.6	culvert.	1	2 by 2	37		
	"	"	"	1308	7.	culvert.	1	2 by 2	36		
	"	"	"	1314	3.	culvert.	1	2 by 2	26		
4th	1	1314	1381	1340	33	bridge.	1	50	4000	1st Oct. 1834	N. W. branch.
	"	"	"		21	culvert.	2	3 by 4	250	1st April, 1834	Mill race.
								Total.	6023		

*The superstructure of this bridge is to be of timber supported upon a Pier and Abutments containing the above quantum of masonry. The bid will be for the masonry alone.

Proposal.

I will build the necessary Culverts and Bridges on the several sections of the first, second, third and part of the fourth divisions of the Lateral Railroad to Washington City, in the manner and by the time required, at the following prices, viz:

No. of divisions.	No. of sections.	Bridges per perch.		Culverts per perch.	
		dolls.	*cents.*	*dolls.*	*cents.*
2d	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
3d	1				
	2				
	3				
	4				
	5				
	6				
4	1				

The name of my nearest post office is County of
and state of

[V.]

Articles of Agreement, made and concluded this day of in the year of our Lord, one thousand eight hundred and thirty between on the first part, and Caspar W. Wever, superintendent of graduation and masonry of the Baltimore and Ohio Railroad, in behalf of the Baltimore and Ohio Railroad Company, of the second part:—

Whereas, the aforesaid party, of the first part, hath agreed for and in consideration of the payments hereinafter mentioned, to build and complete in a mechanical and workmanlike manner upon the lateral road to the City of Washington,

all such arched bridges, gothic and common culverts and walls, which may, in the opinion of the agent of the said company having the superintendence of the said road for the time being, be necessary on the section of the said road, and which masonry thus contracted for by the said party of the first part, shall be built in the most strong and substantial manner,—the foundations to be of such length and depth, and secured in such manner as the said agent may direct. The walls of the abutments, piers, wings and parapets of the bridges, and the walls of the culverts and other walls, to be of such length, height and thickness, and to conform to such slope as the said agent may prescribe. The arch or arches to be composed of stone, dressed to such uniform and regular thickness and length, as the said agent may direct, and of such slope that the sides shall range with, or form radii, of the circle of which the arch may be a segment, and to be so laid and fitted, that each range of stone may form, from side to side of the arch, a regular line or tier with its corresponding exterior or ring stones, and that each stone may break a joint of the preceding range or tier. The parapet walls to be coped their entire length with stone shaped to such form, and to be of such size as the said agent may approve. Such part or portion of the masonry to be *dry*, as the said agent may designate, and the balance laid in mortar, to be composed of such sand and lime, and mixed in such proportions, as the said agent may approve. No stone to be used but such as shall have been approved by the said agent. Such part of the masonry as said agent may require, to be grouted and pointed in such manner as the said agent may direct.

The said party of the first part, shall not let or transfer his contract, or any part thereof, to any other person, without the

consent of the said agent; and shall personally superintend the construction of the masonry hereby contracted for. The said party of the first, shall not employ any mechanics, workmen, or laborers, who commit depredations upon the neighborhood, or insult travellers or other persons, or who have been discharged by any other contractor on said road for riotous or improper conduct, and he shall, upon application of the said agent, immediately discharge any mechanic, workman or laborer, from his employment.

Now this Agreement

Witnesseth, That the said party of the first part, for himself, his heirs, executors and administrators, doth hereby covenant, promise and agree to and with the said party of the second part, that he, the said party of the first part, shall and will, well and faithfully, in a mechanical and workmanlike manner, on or before the day of in the year 183 , build, finish and complete in the manner and on the conditions herein mentioned, all such bridges, gothic and common culverts and detached walls, as the said agent may direct, on the aforesaid section of road; that is to say, the
gothic and common culverts and detached walls on or before the day of 183 ; all circular arched bridges on or before the day of 183 . And the said party of the first part shall remove all such earth, stone, sand, gravel, timber, or other material which, in the opinion of the said agent, obstruct the free passage of the water to, under and from such bridges and culverts as may be built in pursuance of these articles of agreement.

In consideration whereof, the said party of the second part, for and in behalf of the Baltimore and Ohio Railroad Company, doth hereby covenant, promise and agree to and with the said party of the first part, his heirs, executors and administrators, that the said Company shall and will, for doing and performing the work aforesaid, well and truly pay to the said party of the first part, his heirs, executors or administrators, at the rate of dollars and cents for each and every perch of twenty-five cubic feet which arched bridges may contain; and at the rate of dollars and cents for each and every perch which all gothic and common culverts and detached walls may contain. The whole to be measured by the said agent for the time being, whose measurement shall be final and conclusive. Payment to be made in the following manner:—that is say—Each and every month during the progress of the work, the said Company will pay four-fifths of the relative value of

the work done,andof allmaterials and fixtures at the sites of the said bridges and culverts, and after one payment shall havebee made as aforesaid, allmaterial delivered at the site, and fixtures there erected,shall be considered the property of the company, to be judged of by the said agent,until the whole of the masonry hereby contracted for, shall have been finished and completed agreeably to contract, and shall have been accepted by the said agent as so finished and completed. when the balance unpaid shall forthwith be paid to the said party of the first part, his heirs, executors or administrators, and the fixtures and materials remaining and not used in the said bridges or culverts, shall be transferred to the said party of the first part.

The said party of the first part, shall have right and privilege to quarry stone for the masonry hereby contracted for, on any part of the line of said road and haul the same or any other stone over such parts of said road as may be levelled, provided he does not damage said road. In case the said party of the first part, shall damage said road, by quarrying stone therein, or hauling over the same, he shall be charged with such amount of money as the said agent may assess.

And the said party of the first part, for himself, his heirs, executors and administrators, further covenants and agrees with the said party of the second part, that in case the said party of the first part shall not well and truly from time to time comply with and perform all the covenants herein before stated, and stipulated on his part to be done, performed and complied with, in the manner and form, and within the time herein before specified; or in case it should appear to the said agent for the time being, that the work does not progress or go on with sufficient speed; or in case the workmanship shall not be approved by the said agent; or in case the work shall not be commenced within the time or at the place required by the said agent; or in case the said agent shall believe that the good of the work will be advanced by the dismissal of the said party of the first part, the said agent may accordingly dismiss him, by giving him notice in writing, and that then and in that event, the foregoing agreements on the part of the Baltimore and Ohio Railroad Company, and every part and clause thereof, shall become null and void, and the unpaid one-fifth part shall be forfeited by the said party of the first part, to the use of the said company, and the said company shall be at liberty and have full right and authority,any thing herein contained to the contrary notwithstanding, to employ and set to work, or contract with any person or persons in the place and stead of the said party of the first part, and without any inter-

ruption or interference from the said party of the first part, his heirs, executors or administrators.

In witness whereof, the said Caspar W. Wever, superintendent as aforesaid, acting for and in behalf of the Baltimore and Ohio Railroad Company, hath hereunto set his hand, and the said hath hereunto set his hand, the day and year first herein before written.

Signed, Sealed and Delivered in the presence of

[W.]

Articles of Agreement, made and concluded this day of in the year of our Lord eighteen hundred and thirty between of the first part, and Caspar W. Wever, Superintendent of graduation and masonry of the Baltimore and Ohio Railroad, in behalf of the Baltimore and Ohio Railroad Company, of the second part—

Whereas the aforesaid hath agreed, for and in consideration of the payments hereinafter mentioned, to graduate and prepare for the reception of the railways, in a workmanlike manner, a certain part of the aforesaid Baltimore and Ohio Railroad, which said part is the section of the division of said road, as recently laid out by said Company, which said part of said road, thus contracted for, is to be made and completed by the said party, of the first part, in the following manner and on the following conditions, that is to say; the trees shall be cut down and cleared in all cases a width of not less than sixty-six feet; the hills to be cut down, the rocks and earth to be removed,—the valleys, hollows, and abutments of bridges to be filled,—so that the whole of the road shall have such surface width as may be directed, and be so formed as to conform to such field notes of survey and level as shall be furnished. The sides of embankments and the banks of cuttings shall have such slope as the agent of the said Company who may have the superintendence of said section for the time being, may direct. Under all embankment not exceeding two feet in height, the trees shall be grubbed—under all other embankments they may be cut even with the surface of the groun . The embankments shall be formed of successive layers of earth, of such thickness as the said agent may prescribe. No stumps, logs, leaves, or perishable matter of any kind, shall be put into the fillings. Ledges or superembank-

ments of such width and height as the said agent may approve, shall be put on the edges of the embankments and side long fillings. One or more ditches shall be dug or made on each side of the road way of such width and depth, and in all such places as the said agent may designate. All redundant earth shall, in the first place, be applied to increase, equally, the width of the embankments and side fillings, and the balance shall be disposed of in such place as the said agent may direct. In case the cuttings do not supply a sufficiency of earth for the fillings, the deficiency shall be, if so required by the said agent, taken from the nearest cutting, so as to increase, regularly, the width of such cutting, or from such other place as the said agent may point out. All rock, or other substance, on said section, which may be quarried in the construction of said section, shall, if so required, be deposited in such place as the said agent may direct, for which, if not used, or necessarily removed, in the construction of said section, by the said party of the first part, such price shall be paid by the said Company as the agent may adjudge reasonable and just.

French drains shall be constructed of such size and form, and in all such places as the said agent may require. In all such cases, where the said road runs with, crosses or encroaches upon, any river, creek or other water course, it shall be secured against damage from said stream, by forming the embankment of stone exclusively, or by lining it with stone at least three feet thick,—by the excavation of canals for the accommodation of the stream, by widening its channel, or in such other manner as the said agent may direct. Wherever the railroad meets with, crosses, or runs along any road, heretofore used, such bridges are to be built, and such roads opened or prepared, as may, in the opinion of the said agent, be necessary for the accommodation of the travel. Masons or other persons who may contract with the aforesaid Company for the building of bridges, culverts, walls or structures of wood, on any part of the said Baltimore and Ohio Railroad, shall be permitted by the party of the first part, to take from the section of road hereby contracted for, such stones and timber as such mason or other person may think proper, and to haul any material over all or any part of said section which may be levelled, or elsewhere, to the place where such stones or timber may be required, without any interruption. In case the said mason or other person shall, in the opinion of the said agent, damage the said section of road, such sum of money as the said agent may assess, shall be, by the said Company, paid to the said party of the first part. The said

party of the first part, shall commence working on said section at such place as the said agent may designate, and shall, from time to time, work on such other parts or places of said section as the said agent may require. The said section of the road shall be made and completed on or before the day of 183 .

The said party of the first part shall not let or transfer his contract, or any part thereof, to any other person without the consent of the said agent, and shall not employ any workmen or labourers who commit depredations on the neighbourhood, or insult travellers or other persons;—and he shall upon application of the said agent, discharge any workman or labourer from his employment, and he shall not employ any workman or labourer who has been discharged by any other contractor for improper or disorderly conduct.

The said party, of the first part, hereby obligates himself, not to keep or use or suffer to be kept or used, any ardent spirits in his house or shantie, or on or near said section, and to discharge from his employment, any workman or labourer who does keep or use it.

Now this agreement witnesseth, That the said party of the first part for himself, his heirs, executors and administrators, doth hereby covenant, promise and agree with the said party of the second part, that he the said party of the first part, shall and will, well and faithfully, in a workmanlike manner, on or before the day of 183 , make, finish and complete, inthe manner and on the conditions herein before mentioned, all that part of the Baltimore nnd Ohio Railroad, which is designated by the name of the section of the division of said road; begining at station No. and ending at station No.

In consideration whereof, the said party of the second part, for, and in behalf of the Baltimore and Ohio Railroad Company, doth hereby covenant, promise and agree to and with the said party of the first part, his heirs, executors and administrators, that the said Company shall and will, for doing and performing the work aforesaid, well and truly pay or cause to be paid to the said party of the first part, his executors or administrators, at the rate of for each and every cubic yard of excavation be the same wholly earth, or partly earth and partly rock, or wholly rock or other substances,which the said section of the said road may contain, in the following manner, that is to say:—Each and every month during the progress of the work, the Company aforesaid will pay four-fifths of the relative value of such work as may be done, to be estimated in quantity and value by the

said agent, and at such place as the said agent may appoint, until the whole of the section hereby contracted for, shall have been finished and completed, agreeably to contract, and shall have been accepted by the said agent, as so finished and completed, when the balance due shall forthwith be paid to the said party of the first part, his heirs, executors or administrators.

And the said party of the first part, for himself, his heirs, executors or administrators, further covenants and agrees with the said party of the second part, that in case the said party of the first part shall not well and truly, from time to time, comply with and perform all the covenants herein before stated and stipulated on his part to be done, performed and complied with, in manner and form, and within the time herein before mentioned; or in case it should appear to said agent for the time being, that the work does not progress or go on with sufficient speed—that the said agent shall have power to annul this contract of which notice in writing shall be given to said party of the first part, when the foregoing agreements on the part of the party of the second part, and every clause and part thereof, shall become null and void, and the unpaid part of the relative value of the work done on said section of road, shall be forfeited by the said party of the first part, and become the right and property of the said party of the second part; and further that the said Company shall be at liberty, and have full right and authority, any thing herein contained, to the contrary notwithstanding, to employ and set to work, or contract with, any person or persons whomsoever, in the place and stead of said party of the first part, and without any interruption or interference from the said party of the first part, or his heirs, executors or administrators.

In witness whereof, the said Caspar W. Wever, for and in behalf of the aforesaid Baltimore and Ohio Railroad Company, hath hereunto subscribed his name, and the said hath hereunto set his hand, the day and year first herein before written.

Signed, Sealed and Delivered in presence of

[X.]

To Contractors.

The Rail laying will be required to be finished in the manner described in the printed blank articles of agreement.

The prices proposed per pole of single track of Railing, is to be in full for all the work of every kind, necessary to complete the track, as described in the articles of agreement,viz. distributing the materials, dressing the cross-ties, laying down the track, filling it with earth, repairing the washes (landslips excepted) and ledges on the embankments, clearing the ditches, perfecting the graduation for a second track, &c.

It is expected that the 2d Division, and part of the first section of the 3d Division, will be laid with the log string pieces, and the remaining parts of the road with scantling, but bids will be received for both kinds of track, on the several Divisions of the road, as some parts of each of these divisions may be laid with scantling, and the other parts with logs.

No ardent spirits to be kept, or used on or near the work.

Such as intend proposing, are earnestly requested to examine the ground, as no extra allowance will be made for rock, hard earth, iron ore, or any other substance which may be met with in excavating the trenches, or for the occurrence of any unforeseen, or unexpected difficulty whatever.

If the contractor should be delayed in his operations by any cause not attributable to himself—such for instance as not being supplied with materials—or with graduated surface as soon as expected, or from any other cause whatever, a proportional extension of time, to be judged of by the Superintendent, will be given, but no other remuneration or allowance whatever, will be made for such delay.

The logs and cross-ties on the 6th and 7th sections of the 2d Division, will be delivered at such convenient distances as to require very little hauling. The scantling and sleepers will be delivered at such points on the 1st and 3d Divisions, so as not to require, on the part of the contractor, a haul of not exceeding one-tenth of a mile for their distribution. On the balance of the line, the materials will be so placed as not to exceed the distance named in the blank contracts.

The work will be let by Divisions. All the wood work must be laid by the 1st day of December next, or before, on such parts of the road as may be graduated, if so required by the Superintendent, and the iron laid, and the whole finished by the 1st day of May, 1835. But if the iron should be required to be laid on any part this fall, it must be so laid. Such parts as may be required by the Superintendent to be laid with iron, and finished this fall, will be taken off the hands of the contractor as soon as the work shall have been completed.

Co-partnerships have been found vexations. If two or more

persons are interested in a bid, all may sign the proposal. The first signer alone will be acknowledged as the contractor, should the proposal be accepted.

The proposals will enclose the recommendations of the proposers, be sealed up, endorsed with the words "*Proposal for Rail Laying*," and directed to the subscriber, and may be left on or before the 20th day of this instant, at the subscriber's office, at Ellicott's Mills, or with Mr. J. D. Steele, assistant superintendent.

Those whose bids may be accepted by the President and Directors, will be advised of it by letter, without delay, as the work must be actively commenced, on or before the 1st day of September, 1834. CASPAR W. WEVER.

August 5, 1834.

An Exhibit

Of the length of the First, Second and Third Divisions, and of the 1st Section of the Fourth Division of the Lateral Railroad to Washington City.

No. of Division.	Station of commencement.	Station of Termination.	Length in Poles.
1	1	293	1777
2	293	870	3488
3	870	1314	2585
4	1314	1381	406

Proposal.

I will lay the Rails on the following Divisions of the Lateral Railroad to Washington City, on the terms set forth in the preceding specifications, and in the blank contracts, for the prices set opposite them respectively.

No. of Division.	Price per Pole of Log track.		Price per Pole of Scanling tr ack	
1	*Dolls.*	*Cts.*	*Dolls.*	*Cts.*
2				
3				
4				

And I will complete the same satisfactorily. My nearest Post Office is County of and State of

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[Y.]

Articles of Agreement, made and concluded this day of in the Year of our Lord, one thousand eight hundred and thirty between of the first part, and Caspar W. Wever, Superintendent of the Baltimore and Ohio Railroad, in behalf of the Baltimore and Ohio Railroad Company, of the second part.

Whereas, the said party of the first part has agreed for, and in consideration of payments hereinafter mentioned, to lay and complete, in a mechanical and workmanlike manner, a single track of Railway, on and throughout the Division, and the First Section of the 4th Division of the Lateral Railroad to Washington City, and also on said such portions of a second track as may be required by said Company to be constructed for turnouts, sidings, &c., agreeably to the following conditions, explanations, and descriptions, and as the said Superintendent may require in pursuance thereof; that is to say, one description of said single track of railway will consist of scantling sills six inches square, and from twelve to forty feet long, of cross-ties, from seven to seven and an half feet long, clear of kerf, and from five and a

half to eight inches thick and upwards, clear of sap; of yellow pine scantling string pieces six inches square, and from sixteen to forty feet long, and of edge iron rails, about fifteen feet long, and weighing about forty pounds to the yard.

The sills will be laid in trenches, cut for their reception longitudinally of the road, so that the upper surface of them will be from 2 to 5 inches below the graded surface of the road bed, and so as to form two continuous parallel lines, four feet $10\frac{3}{4}$ inches from centre to centre, and so that the centre of the one next the centre line of the road shall be three feet from said centre line. The trenches will be from eight to 11 inches deep, and of suitable width, and will be cut of such exact depth as to make it unnecessary to introduce any loose earth, or other material under the sills. The sills will be settled with mauls until they rest solidly, and uniformly, on the bottoms of the trenches, and when laid, must correspond both in vertical and lateral position, to the marks, and stakes, given by the superintendent, his assistants, or other agents of the company, appointed for that purpose.

The under side of each cross-tie will be hewed so as to be straight from end to end, and so as to have a fair bearing of at least 3 inches in width, clear of sap, at the points which will rest on the sills. Two notches will be cut in each cross-tie, not less than $2\frac{1}{2}$, nor more than 4 inches in depth, clear of sap, and of such width as to admit the string piece and key;—that is to say, each notch in the middle shall be $7\frac{3}{4}$ inches wide, and to be so cut that the outer side of each notch shall be parallel to the centre line of the road, and perpendicular to the bottom of the notch, and the inner side shall have such a slope, longitudinally of the road, as to correspond to the key hereafter described.—The two notches will be 5 feet $4\frac{3}{4}$ inches apart from out to out, and the bottoms of said notches will be $2\frac{1}{2}$ inches from, and parallel to, the hewed side of the cross-tie. The cross-ties, thus prepared, will be laid at right angles to the centre line of the road, and 4 feet apart from centre to centre, and so that those parts directly under the notch, will rest on the sills with a firm and uniform bearing. If in the opinion of the superintendent, or other superintending agent, additional cross-ties may be necessary in particular places, they shall be applied. The direction of the larger and smaller ends of the cross-ties may be alternated: that is to say, they must be laid so as to have their larger ends first on the one, and then on the other, side of the track, and the largest cross-ties must be selected, and laid, under the joinings of the string pieces.

The cross-ties being thus properly adjusted, the string pieces will be laid with their heart sides, or corners down, and fitted into the notches, so as to have a uniform bearing on the bottoms of said notches, and so as to form two continuous and parallel lines of the required level, and lateral position, throughout such portions of the road as may be thus laid. The joinings of the string pieces will be effected by their ends butting together on a cross-tie, and the joints must be square and close; two joints must not be made on the same cross-tie. The string pieces will be fastened into the said notches, with keys, made by the contractor, of the ends of the scantling, which it may be found necessary to cut off, and of such other wood as may be furnished by the company for that purpose. The keys to be 12 inches in length, 2 inches in uniform vertical depth, one and three-fourth inches at the larger, and tapering regularly to one inch in thickness, at the smaller end; they will be driven firmly at the bottom of the inner side of each notch, so that one side of the key shall fit the side of the notch, throughout the length of said notch, whilst the other side fits the string piece, throughout the length of the key. The cross-tie must not be split, or the key unnecessarily bruised or injured in driving.

Before the iron rail is laid, the string pieces must be made to present a fair and continuous even plane, lengthwise of the road, corresponding to the levels given by the superintendent, or other persons appointed by him or the company, for that purpose, as superintending agents.

The string piece being thus prepared, the iron rails are next to be laid; they will rest centrally on the string pieces, so as to form a carriage track of 4 feet $8\frac{1}{2}$ inches in width, of the required level and lateral position, or 4 feet $10\frac{3}{4}$ inches from centre to centre of said iron rails—and the rails must be parallel to, and the centre of the interior rail be 3 feet from, the centre line of the road. The said iron rails will rest on cast iron chairs, which chairs will be let into the string pieces, at each end of the rail, and fastened to them with spikes, as the agent, superintending the work for the time being, may direct, and so that the upper surface of said chair, on which the base of the rail is to rest, will be even with the upper surface of the string piece, and so that the rail may also rest regularly upon the string piece between the chairs. The iron rail will be fastened to the string piece, and chair, with clips, or spikes, or both, in such manner as may be directed by said agent.

The ends of the rails will be placed such distance apart, not exceeding one-fourth of an inch, as may be required by the said agent, so as to allow for the expansion of the metal by changes

in temperature, and the joinings of the iron rails shall not in any case be within one foot of the joinings of the string pieces

Another portion of said single track of railway will consist of log string pieces, 16 and 24 feet, and upwards, long, and of 8 inches and upwards, in diameter at the smaller end, hewed on one side so as to have a straight and level bearing for the iron, of at least $2\frac{1}{4}$ inches in width each side of a straight line, drawn from end to end of the log, and of cross-ties, and iron rails, similar to those herein before described.

The cross-ties will be dressed as herein before stated, except that the thickness below the notch need not be uniformly $2\frac{1}{2}$ inches, but it must in no case be less. They will be solidly embedded in the ground, at right angles to the centre line of the road, and 8 feet from centre to centre, so that the bottoms of the notches will be either coincident with the graded surface of the road, or, if so required, from one to three inches below it, and so that they will conform, both in vertical and lateral position, to the marks and stakes given by the superintendent, or such persons as he or the company shall appoint as agent for that purpose. But if in the opinion of the superintendent, or said agents, additional cross-ties, or semi-cross-ties, may be necessary, they shall be applied.

About one foot in length of the logs at the ends, and about two feet in length, at uniform distances of 8 feet, will be reduced to 6 inches square, of which square the aforesaid hewed surface shall form one side. The two sides at right angles to it, shall each be 3 inches from, and parallel to, the aforesaid straight line passing through the centre of the said hewed surface. At such places where it may be necessary to pass private or other roads across the railroad, the logs shall be hewed six inches square, a length of not more than 40, nor less than 12 feet; and in such cases, the cross-ties shall not be more than four feet apart, from centre to centre, and shall be hewed both on the under and upper sides, so as to be of a regular thickness, not less than $3\frac{1}{2}$ inches, without notches, in lieu of which, such cast iron knees as may be furnished by the company, will be used. The cross-ties throughout their length, in each description of track, shall in no case rise higher than 4 inches above a line drawn through the bottoms of the notches of said cross-ties—and in the middle shall not be more than $2\frac{1}{2}$ to 3 inches above said line. The log string pieces being thus prepared, they will be fitted, and keyed into the notches in the cross-ties, as is required in the case of scantling strings, and the track will be finished, in all other respects, similar to that hereinbefore described.

When turnouts or crossings are necessary, the contractor will

make them, if so required by the said superintendent, or other agent appointed as aforesaid, and in such manner as said superintendent or other agent may direct, for which such an allowance will be made him, as in the opinion of the said superintendent, or other agent, is fair and just.

All materials necessary for the construction of the track, will be delivered at the charge of the company, on such points on the contract, as will make the average haul from the places at which they are delivered, to the places at which they are to be used, not more than one fourth of a mile.

The work must be executed without unnecessary waste of materials of any kind; and should any of the said materials remain unused after the track is finished, they will be collected together by the contractor, and safely deposited at such points, as the superintendent or other agent may designate.

After the track is thus finished, the road bed will be cleared of all chips or other perishable matter, and the side or half of the road bed in part occupied by the said track, will be raised with earth, sand, or gravel, hauled from such convenient points on the side of the road as may be designated by the superintendent or other agent, so that the said side (or half of the graduated road bed surface,) from the centre, to the outer edge thereof, shall have a smooth and even surface, which shall be elevated, at least, one inch above the strings.

If so required, the contractor shall form ditches to drain the centre of the track. The raising of the surface and the formation of drains shall be done at such time or times, and in such manner, as may be directed by the superintendent or other agent.

The side ditches on all such parts of the road as may be laid with rails, in pursuance of this contract, will be opened, and the ledges of the embankments replaced. The graduation of the remaining half or side of the road bed, shall be repaired and in all respects prepared for the reception of the second track of rails.

The said party of the first part, shall commence working on the said of the road, at such place or places, and shall from time to time work on such other parts or portions of said as the said superintendent or other agent appointed as aforesaid, may designate and require; and at any time that the superintendent or said agent shall believe that the condition of the road bed, or state of the weather, is unsuitable to progress with the work, it shall be suspended, if so directed by the said superintendent or agent. The said single track of railway, with the required turnouts and crossings, shall be made, and com-

pleted on or before the day of , 183 , or sooner, if so required by the superintendent or other agent appointed as aforesaid.

The said party of the first part, shall not let or transfer his contract, or any part thereof, to any other person or persons, without the consent of the said superintendent, and shall not employ any workmen or laborers who commit depredations on the neighborhood, or insult travellers or other persons; and he shall, upon application of the said superintendent, discharge any workman or labourer from his employment; and he shall not employ any workman or labourer who has been discharged for improper or disorderly conduct, by any other contractor or manager of any of the works of said company.

The said party of the first part, hereby obligates himself, not to keep or use, or suffer to be kept or used, any ardent spirits in his house or shantee, or on or near said section, and to discharge from his employment, any workman or labourer who does keep or use it.

Now, this agreement witnesseth, That the said party of the first part, for himself, his heirs, executors and administrators, doth hereby covenant, promise and agree, to and with the said party of the second part, that he, the said party of the first part, shall and will, well and faithfully, in a mechanical and workmanlike manner, on or before the day of 183 , or sooner, if thereto required by the superintendent or other agent appointed as aforesaid, lay, finish and complete, in the manner, and on the conditions herein before mentioned, a single track of Railway, and the required turnouts and crossings, as aforesaid, viz: on the Division, and on the first section of the 4th Division of the Lateral Railroad to Washington City.

In consideration whereof, the said party of the second part, for, and in behalf of the Baltimore and Ohio Railroad Company, doth hereby covenant, promise and agree to and with the said party of the first part, his heirs, executors and administrators, that the said Company shall and will, for doing and performing the work aforesaid, well and truly pay or cause to be paid to the said party of the first part, his executors or administrators, at the rate of dollars and cents per pole, for each and every pole of sixteen and half feet in length of the said single track of scantling Railway, which may be laid on the said and at the rate of dollars and cents for each and every pole of log track which may be laid on said in the following manner, that is to say:—Each and every month during the progress of the work, the Company

aforesaid will pay four-fifths of the relative value of such work as may be done, to be estimated by the said superintendent, his assistants, or such other agent as may be appointed by the Company, or by the superintendent, for that purpose, to be paid at such place as the said superintendent may appoint, until the whole of the work hereby contracted for, shall have been finished and completed, agreeably to contract, and shall have been accepted by the said agent, as so finished and completed, when the balance due shall forthwith be paid to the said party of the first part, his heirs, executors or administrators.

And the said party of the first part, for himself, his heirs, executors or administrators, further covenants and agrees with the said party of the second part, that in case the said party of the first part shall not well and truly, from time to time, comply with and perform all the covenants herein before stated and stipulated on his part to be done, performed and complied with, in the manner and form, and within the time herein before mentioned; or such time as may, in pursuance of this contract, be hereafter required by the said superintendent, his assistant, or such other agent as the company, or the superintendent, may appoint to superintend the work; or in case it should appear to the said superintendent for the time being, that the work does not go on with sufficient speed, that the said superintendent shall have power to annul this contract, of which notice in writing shall be given to said party of the first part, when the foregoing agreement on the part of the party of the second part, and every clause thereof, shall become null and void, and the unpaid part of the work done on said of road, shall be forfeited by the said party of the first part, and become the right and property of the said party of the second part; and further that the said Company shall be at liberty, and have full right and authority, any thing herein contained, to the contrary notwithstanding, to employ and set to work, or contract with, any person or persons whomsoever, in the place and stead of the said party of the first part, and without any interruption or interference from the said party of the first part, or his heirs, executors or administrators.

In witness whereof, the said Caspar W. Wever, for and in behalf of the aforesaid Baltimore and Ohio Railroad Company, hath hereunto subscribed his name, and the said hath hereunto set his hand, the day and year first herein before written.

Signed, Sealed and Delivered in presence of

[Z.]

Articles of Agreement, made and concluded this day of in the year of our Lord, one thousand eight hundred and thirty between of the first part, and Caspar W. Wever, Superintendent of the Baltimore and Ohio Railroad, in behalf of the Baltimore and Ohio Railroad Company, of the second part.

Whereas, the said party of the first part has agreed for, and in consideration of payments hereinafter mentioned, to lay and complete, in a mechanical and workmanlike manner, a single track of Railway, on and throughout that part of the Baltimore and Ohio Railroad, extending from and also such portions of a second track as may be required by said Company for turnouts, sidings, &c., agreeably to the following conditions, explanations, and descriptions, and as the Superintendent may require in pursuance thereof; that is to say, the said single track of railway will be composed of sleepers, from 7 feet 8 inches, to 8 feet long, supported by columns of broken stone; of scantling from 12 to 40 feet long, and six inches square, and of iron rails about 15 feet long, $2\frac{1}{4}$ inches wide by $\frac{5}{8}$ of an inch thick.

The broken stone will be furnished by the party of the first part, at his own proper cost. It will be of such sound stone as may be approved of by the superintendent, or such agent as the Company or the Superintendent may appoint, and be reduced, by men in a sitting posture, with short-handled light hammers, to particles not exceeding six ounces in weight, which will be deposited on the graduated surface in heaps convenient for use, and the quantity required for each hundred feet of track, shall be deposited within that distance, for inspection and approval, by the Superintendent or other agent, appointed as aforesaid, before it shall be used. After the broken stone shall have been thus approved of, it shall be compactly placed in holes, excavated of such shape and size, and not exceeding one foot in depth, as the Superintendent or other agent appointed as aforesaid, may direct. It is, however, to be understood, that said holes are not to be of a greater capacity than one and a half cubic feet. There will be two rows of holes excavated for the reception of the broken stone, which will be 4 feet $11\frac{1}{2}$ inches apart, from centre to centre, and in the rows the holes will be 4 feet apart, from centre to centre. The row of holes next the centre line of the road, shall have its centre 2 feet $4\frac{5}{8}$ inches from said centre line. The broken stone shall be clean, and be firmly compacted in the holes, by heavy rammers, and the finer particles thereof, shall be selected and laid on the top of the columns, in order to afford a

solid and even surface for the sleeper to rest upon. The top of the column will rise to within such distance, say from $2\frac{1}{2}$ to 6 inches of the grade of the road bed, as may suit the different thicknesses of the sleepers.

The sleepers will be cut or sawed even and square at both ends, be hewed straight on one side, from end to end, so as to have a fair bearing of at least 3 inches, clear of sap, at the points which will rest on the columns of broken stone. Two notches will be cut in each sleeper, of not less than 2, nor more than 4 inches in depth, clear of sap, and $7\frac{3}{8}$ inches wide, and be so cut that the outer side of each notch shall be perpendicular to the bottom of said notch, and when the sleeper shall have been laid at right angles with the centre line of the road, the said outer side of the notch shall be parallel to said centre line; and the inner side shall have such slope longitudinally of the road, as shall correspond to a key tapering $\frac{3}{4}$ of an inch in 12 inches. The two notches will be 5 feet $7\frac{3}{4}$ inches a part from out to out, and each notch will be from 12 to 14 inches from the end of the sleeper. The sleepers, between the notches, shall be so dressed or shaped, that at the notches they shall rise from 2 to $2\frac{1}{2}$ inches, clear of sap, above said bottoms, but no higher; and in the middle they shall rise about one inch above the level of the bottoms of the notches. Those portions of the sleepers between the notches and the ends, shall not be cut down unless they rise higher than 4 inches above the bottoms of the notches.

The sleepers having been prepared as aforesaid, or according to such other forms and dimensions as may be prescribed by the Superintendent or agent appointed as aforesaid, they will be laid in trenches cut transversely of, and at right angles with, the centre line of the road, and 4 feet apart from centre to centre, and so that the centres of the notches may rest firmly upon the centres of the stone columns. They shall then be firmly embedded in said trenches, by ramming the earth around them.

The bottoms of the notches shall be coincident with the grade of the road bed, and the outer side of the notch next the centre line of the road, shall be 2 feet $1\frac{5}{8}$ inches from said centre line; and when laid, the sleepers shall, in all respects, conform to such levels, marks and stakes, as may be given by the Superintendent, or other agent appointed as aforesaid. The direction of the large and smaller ends of the sleepers, must be alternated, that is, they must be so laid as to have their larger ends first on the one, and then on the other, side of the track, and the largest sleepers must be selected and laid under the joinings of the string pieces which are to be placed upon them. At such place where it may be necessary to pass private or other roads over the rail road, and elsewhere, if so required by the Superintendent or other agent appointed as aforesaid, the sleepers shall be hewed

both on the under and upper sides, so as to be of a thickness of not less than 3½ inches, without notches, in lieu of which, such cast iron knees as may be furnished by the Company, shall be used. Additional sleepers shall be applied at all such places as the Superintendent or other agent, appointed as aforesaid, may direct.

The sleepers being thus prepared and adjusted, the string pieces will be laid with their heart sides, or corners down, and fitted into the notches, so as to have an uniform bearing on the bottoms of said notches, and so as to form two continuous and parallel lines of the required level and lateral position throughout such portions of the road as may be laid in virtue of this agreement. The centre of the string next the centre line of the road shall be 2 feet 4⅝ inches from the said centre line. The joinings of the string pieces will be effected by their ends butting together on a sleeper, forming square and close joints, and two joints must not be made on the same sleeper. The string pieces will be fastened into the notches of the sleepers, with keys made by the contractor, out of the ends of the scantling, which it may be found necessary to cut off, and of such other wood as may be furnished by the company for that purpose. The keys to be 12 inches in length, 2 inches in uniform vertical depth, one and three fourths inches at the larger, and tapering regularly to one inch in thickness, at the smaller end. They will be driven firmly at the bottom of the inner side of each notch, so that one side of the key shall fit the side of the notch, throughout the length of said notch, whilst the other side fits the string piece, throughout the length of the key. The sleeper must not be split, or the key unnecessarily bruised or injured in driving. After the string pieces have been thus secured, they must be made to present continuous even planes, lengthwise of the road, corresponding to the levels given by the superintendent, his assistants or other agents appointed by the company or by the superintendent.

The string pieces being thus prepared so as to form a carriage track of 4 feet 9¼ inches in width, or 4 feet 11½ inches from centre to centre, of said iron rails, and the rails must be parallel to, and the centre of the interior rail 2 feet 5¾ inches from the centre of the road. The iron rails will rest, at their ends on small thin iron plates, carefully let into the string pieces immediately under the joinings of the iron rails, and fastened to the string pieces with two nails, and so that the upper surface of said plates shall be exactly even with the surface of the said string pieces and so as to allow the iron rail to rest regularly on the string pieces between the said plates. The iron rails will then be laid at such distances apart lengthwise of the road, not exceeding one quarter of an inch, as the superintendent or other agent appointed as aforesaid, may direct, to allow for the expansion of the iron, and

will then be secured to their proper places by driving spikes into the string pieces, through the holes which have been made in the rails for that purpose. The driving of the spikes must be done with care so that neither the spikes nor the rails may be injured, and so that the rails may not be drawn edgewise from the position they ought to occupy on the string piece. Any of the iron rails which shall have been bent shall be straightened by the contractor before they are laid. The joinings of the iron rails shall not be nearer than one foot to the joinings of the string pieces. The projecting inner edge or corner of the string, shall then be neatly cut or hewed off, so as not to obstruct the free passage of the flanges of wheels along the edge of the iron rails.

When turnouts and crossings are necessary the party of the first part will make them if thereto required by the superintendent or other agent appointed as aforesaid, and in such manner as said superintendent or said agent may prescribe, for which such an allowance will be made as said superintendent or said agent may deem reasonable and just.

The work must be executed without unnecessary waste of materials of any kind, and should any of the materials remain on hand after the track shall have been finished, such as are of wood shall be collected and piled, by the party of the first part on such points on the road side, and such as are of iron shall be delivered into such store or other house at the Point of Rocks, as the said superintendent or said agent, may designate.

All materials of wood necessary for the construction of the track, turnouts and sidings, will be delivered by the company at such points on the berm bank of the Chesapeake and Ohio canal, or at such places on the line of the railroad, at the option of the company, as shall not be, on the average, more than one mile assunder, and such of the materials as are of iron will be delivered by the company in such ware-house at the Point of Rocks as the company may select. From these several places of deposit to the places where used, the materials will be taken by the party of the first part and at his expense.

After the track, turnouts and sidings shall have been finished, the road bed surface throughout its entire width will be cleared of all chips and other perishable matter and also of the earth which may be excavated from the holes sunk for the reception of the broken stone columns. The track will then be filled or raised with earth, sand or gravel, at the option of the contractor, one inch above the level of its grade, and such other parts of the surface of the road bed as are below the grade will be raised with earth, sand or gravel up the level of the grade; all the side ditches will be opened and cleared; the ledges of the embankments,

will be repaired, and generally, such work will be done by the party of the first part, as will leave the whole surface of the road bed in complete order, and in a proper and fit condition for the reception of the second track of rails. The earth, sand or gravel which may be used for this purpose will be taken from such convenient points on the line of the road, as the superintendent or other agent appointed as aforesaid, may designate.

It is further understood and agreed by the parties, that if any delay should occur in consequence of the materials not being delivered in proper time, or in consequence of the graduation of the road bed not being done as soon as required by the contracts of the several contractors of graduation and of masonry, or arising out of any other cause whatever, not attributable to the party of the first part, it shall not constitute or be used or urged as the ground of a claim upon the party of the second part, for extra compensation or damage.

The said party of the first part, shall commence working, at such place or places, and shall from time to time work on such other portions of said

as the said superintendent or other agent appointed as aforesaid, may designate and require; and at any time that the superintendent or said agent shall believe that the condition of the road bed, or state of the weather, is unsuitable to progress with the work, it shall be suspended, if so directed by the said superintendent or agent, for such time as the said superintendent or agent shall direct, when it shall again be resumed. The said single track of railway, with the required turnouts and crossings, shall be made, and completed on or before the day of , 183 , or sooner, if so required by the superintendent or other agent appointed as aforesaid.

The said party of the first part, shall not let or transfer his contract, or any part thereof, to any other person or persons, without the consent of the said superintendent, and shall not employ any workmen or laborers who commit depredations on the neighborhood, or insult travellers or other persons; and he shall, upon application of the said superintendent, discharge any workman or labourer from his employment; and he shall not employ any workman or labourer who has been discharged for improper or disorderly conduct, by any other contractor or manager of any of the works of said company.

The said party of the first part, hereby obligates himself, not to keep or use, or suffer to be kept or used, any ardent spirits in his house or shantee, or on or near said section, and to discharge from his employment, any workman or labourer who does keep or use it.

Now, this Agreement

Witnesseth, That the said party of the first part, for himself, his heirs, executors and administrators, doth hereby covenant, promise and agree to and with the said party of the second part, that he, the said party of the first part, shall and will, well and faithfully, in a mechanical and workmanlike manner, on or before the day of , 183 , or sooner if thereto required by the superintendent or other agent appointed as aforesaid, lay, finish and complete in the manner, and on the conditions herein before mentioned, a single track of Railway, and the required turnouts and crossings, as aforesaid, on the said

In consideration whereof, the said party of the second part, for and in behalf of the Baltimore and Ohio Railroad Company, doth hereby covenant, promise and agree to and with the said party of the first part, his heirs, executors and administrators, that the said Company shall and will, for doing and performing all the work aforesaid, well and truly pay or cause to be paid to the party of the first part, his executors or administrators, at the rate of dollars and cents per pole, for each and every pole of sixteen and a half feet in length of the said single track of Railway, which may be laid on the said

in the following manner; that is to say, each and every month during the progress of the work, the Company aforesaid will pay four-fifths of the relative value of such work as may be done, to be estimated by the said superintendent, his assistants, or such other agent as may be appointed by the Company, or by the superintendent, for that purpose, to be paid at such place as the said superintendent may appoint, until the whole of the work hereby contracted for, shall have been finished and completed, agreeably to contract, and shall have been accepted by the said agent, as so finished and completed, when the balance due shall forthwith be paid to the said party of the first part, his heirs, executors, or administrators.

And the said party of the first part, for himself, his heirs, executors, or administrators, further covenants and agrees with the said party of the second part, that in case the said party of the first, shall not well and truly, from time to time, comply with and perform all the covenants hereinbefore stated, and stipulated on his part to be done, performed and complied with, in the manner and form, and within the time herein before mentioned, or such time as may, in pursuance of this contract, be hereafter required by the superintendent, his assistants, or such other agent as the

company, or the superintendent, may appoint to superintend the work; or in case it should appear to the said superintendent for the time being, that the work does not go on with sufficient speed, that the said superintendent shall have power to annul this contract, of which notice in writing shall be given to the said party of the first part, when the foregoing agreement on the part of the party of the second part, and every clause thereof, shall become null and void, and the unpaid part of all the work then done on said

shall be forfeited by the said party of the first part, and become the right and property of the said party of the second part; and further, that the said company shall be at liberty, and have full right and authority, any thing herein contained to the contrary notwithstanding, to employ and set to work, or contract with, any person or persons whomsoever, in the place and stead of the said party of the first part, and without any interruption or interference from the said party of the first part, or his heirs, executors, or administrators.

In witness whereof, the said Caspar W. Wever, for and in behalf of the aforesaid Baltimore and Ohio Railroad Company, hath hereunto subscribed his name, and the said
hath hereunto set his hand, the day and year first hereinbefore written.

Signed, Sealed and Delivered in the presence of

[C.]

Office of Transportation,
B. & O. Railroad Co., 1st October, 1835.

Philip E. Thomas, Esq.

President.

Sir:—I have the honor to submit to you the tabular statements of the operations on this Railroad, for the year terminating this day.

It will be seen on referring to these documents—marked C, No. 1 to No. 6—that the total receipts have been $263,368.10, being for Passengers, $93,540.22, and for Tonnage, $169,827.88. It will be also found that the expenses have been $156,204.39: and that the net revenue has been $107,163.71; being an increase in the gross receipts of this year, over those of the last, of $57,931.52; and of $34,589.54 in the net revenue.

On further comparing the other general operations of the Road for the last year, with the preceding, results of an equally satisfactory character will be found to have taken place. Among these, it will be remarked, that the amount of Tonnage has augmented from that of 1834, 16,513 tons, viz.

	Tons.	*Cwt.*		
Total quantity of 1835, - - -	72,634.	11.	—	—
do of 1834, - - -	56,120.	17.	3.	21
Increase, - - -	16,513.	13.	—	7

Again:—it will be seen also, that during the year the augmentation in the transportation of Flour,—the great staple of this market,—has been considerable, amounting as the aggregate does to 268,162 barrels, viz.

	Barrels.
Total quantity of 1835, - - - - - -	268,162
do do of 1834, - - - - - -	182,211
Increase, - - - - - -	85,951

This increase to the business of the Road, has been principally caused by the trade received from the neighbouring counties of Virginia, since the extension of the Railway to Harper's Ferry; and in relation to this business it may not be irrelevant to state, that it is almost exclusively a new trade, secured to

Baltimore by the operation of this work, having by its means been withdrawn from other markets in favor of this city. In reference to the extent of this improvement, it is found that the quantity of Flour transported on this road from the Potomac alone, has exceeded that conveyed during the previous year from the same quarter, by 65,200 barrels, viz.

The total quantity from the Potomac, for 1835, being	87,605
" " for 1834, "	22,405
Increase, - - - - -	65,200

It will be seen, on reference to the statement of expenses, that an increased amount has been disbursed in the repairs of the Railroad. This has been occasioned, principally, by the necessity of renewing considerable portions of the wood work, which had become decayed. Every effort has been made to controul this growing source of expense, but it is one which will probably for some time continue to augment. These repairs have for the year amounted to $25,103.63.

It has not been deemed necessary, with the tables now presented to you, to submit any detailed statement of the operations on the Washington Branch of this work, during the brief period of its being used by the public. It may, however, be satisfactory to exhibit on this occasion, a concise return of its gross receipts. These, from the 20th July, when it was opened, as far as Bladensburg, have been, viz.

	Passengers.	*Amount.*
For July, (for 12 days)	1,564	3,209.72
" August, - - - -	4,394	9,028.15
" September, - - -	6,189	14,451.95
Total, -	12,147	$26,689.82

The work was further used throughout its entire extent to Washington, on the 25th August; and it will be observed, that since that period, a decided improvement has taken place in its revenue.

Respectfully submitted,

W. WOODVILLE,

Sup'dt. B. & O. R. R.

[C. No. 1.]

STATEMENT of the Revenue received for the transportation of Passengers on the Baltimore and Ohio Railroad, from the undermentioned places, respectively, from the 1st October, 1834, to the 30th of September, 1835, inclusive, viz.

REVENUE FROM PASSENGERS.

During the month of	Baltimore.		Ellicott's Mills.		Frederick.		Harper's Ferry.		Total.	
	Passengers.	Amount.	Passengers.	Amount.	Passengers.	Amount.	Passengers.	Amount.	Passengers.	Amount.
October,	3,426	$3,925.28	1,865	$738.64	2,069	$2,624.43	803	$1,001.44	8,163	$8,289.79
November,	2,230	2,644.99	1,803	632.01	1,600	1,858.62	505	543.47	6,138	5,679.09
December,	1,671	2,141.62	1,406	513.29	1,330	1,791.19	735	814.79	5,142	5,260.89
January,	1,084	1,729.62	778	291.49	910	1,335.52	538	684.61	3,310	4,041.24
February,	941	1,563.48	767	300.22	926	1,396.02	492	631.89	3,126	3,891.61
March,	1,670	2,940.31	1,085	409.00	1,468	2,366.32	746	937.99	4,969	6,653.62
April,	2,618	3,374.71	1,492	567.86	1,423	2,066.23	895	1,298.57	6,428	7,307.37
May,	3,928	3,991.46	1,833	725.48	1,658	2,212.59	1,060	1,426.65	8,479	8,356.18
June,	4,243	4,043.29	2,322	865.49	1,801	2,306.16	1,172	1,589.97	9,538	8,804.91
July,	6,990	5,516.08	2,760	999.63	1,877	2,456.20	1,117	1,540.61	12,744	10,512.52
August,	8,826	6,387.12	2,530	938.60	2,374	3,351.63	1,048	1,650.95	14,778	12,328.30
September,	10,038	7,190.10	1,994	730.96	1,878	2,725.69	1,033	1,767.95	14,943	12,414.70
Total,	47,665	45,448.06	20,635	7,712.67	19,314	26,490.60	10,144	13,888.89	97,758	93,540.22

Note. There are included in the revenue for July, August and September, the following amounts received for the proportion due to the Baltimore and Ohio Railroad Company, for the travelling on the eight miles of this Railroad used in the transportation to and from the Washington Branch Railroad, viz.

	Passengers.	*Amount.*
July, -	1,564	$ 779.50
August, -	4,394	2,063.25
September,	6,189	2,875.45

Sup'dt. B. & O. R. R.

Statement of the Revenue received for the Transportation of Tonnage on the Baltimore and Ohio Railroad, from the 1st October, 1834, to the 30th of September, 1835.

During the month of	Westwardly.		Eastwardly.		Total.	
	Tonnage.	Amount.	Tonnage.	Amount.	Tonnage.	Amount.
October,	3078. 2.1.14	$7419.50	3758.13.0.21	$7057.30	6836.15.2. 7	$14,476.80
November,	1835. 2.1.21	3853.04	4109. 7.1.21	7999.88	5944. 9.3.14	11,852.92
December,	1588.14.1.14	3703.52	3798.12.2. 0	8186.16	5387. 6.3.14	11,889.68
January,	1471.18.0.14	6248.84	2806. 4.0. 0	6958.06	4278. 2.0.14	13,206.90
February,	1338. 4.2. 7	2929.11	3488. 4.0. 7	10142.45	4826. 8.2.14	13,071.56
March,	1871.11.0. 0	4681.43	4806. 3.0. 0	11830.94	6677.14.0. 0	16,512.37
April,	2722.13.0. 0	7737.85	4491. 4.1.21	10619.20	7213.17.1.21	18,357.05
May,	2397.19.2. 0	6422.82	4791.15.2.14	13195.32	7189.15.0.14	19,618.14
June,	1838. 9.0. 0	4935.86	4210. 0.0. 0	10647.71	6048. 9.0. 0	15,583.57
July,	1640. 8.3. 0	3739.50	3000. 3.2. 7	5341.90	4640.12.1. 7	9,081.40
August,	2185. 6.3. 7	4862.74	3722.14.2.21	6009.19	5908. 1.2. 0	10,871.93
September,	3687. 0.2. 7	8238.88	3995.18.0. 0	7066.68	7682.18.2. 7	15,305.56
Total,	25,655.10.2. 0	64,773.09	46,979.0. 2. 0	105,054.79	72,634.11.0. 0	169,827.88

[C—No. 3.]

Statement of the Aggregate Revenue received on the Baltimore and Ohio Rail Road. from the 1st October, 1834, to the 30th of September, 1835, viz:

During the month of	From Passengers.		From Tonnage.		Total.
	Passengers.	Amount.	Tons.	Amount.	
October,	8163	$8289.79	6836. 5.2. 7	$14476.80	$22,766.59
November,	6138	5679.09	5944. 9.3.14	11852.92	17,532.01
December,	5142	5260.89	53875.6.3.14	11889.68	17,150.57
January,	3310	4041.24	4278. 2.0.14	13206.90	17,248.14
February,	3126	3891.61	4826. 8.2.14	13071.56	16,964.17
March,	4969	6653.62	6677. 4.0. 0	16512.37	23,163·99
April,	6428	7307.37	7213.17.1.21	18357.05	25,661.42
May,	8479	8356.18	7189 15.0.14	19618.14	27,974.32
June,	9538	8804.91	6048. 9.0. 0	15583.57	24,388.48
July,	12744	10,512.52	4640.12.1. 7	9081.40	19,593.92
August,	14778	12,328.30	5908. 1.2. 0	10871.93	23,200.23
September,	14943	12,414.70	7682.18.2. 7	15305.56	27,720.26
Total,	97,758	93,540.22	72,634.11.0 0	169,827.88	263,368.10

RECAPITULATION.

Transportation.	Revenue.
97,758 Passengers.	$93,540.22
72,634.11.0.0 Tons.	169,827.88
Total, - -	$263,368.10

[C—No. 4.]

Statement of the expenses incurred in working the Baltimore and Ohio Railroad, for the official year ending on the 30th September, 1835, viz.

Item 1. Moving Power, including feed, shoeing and attendance on the stock, their harness and pay of drivers;—the expense of working the Railway in the streets, and the inclined planes; together with the estimated wear and tear of horses, &c. and their depreciation in value, ($5,787.65) - - $76,732.24

2. Salaries of Agents and Conductors, and the Superintendent of Transportation, - - - 16,623.59

3. Depot expenses, and expense of Stations on the Road, and of Supervisors at the same, - 12,868.46

4. Contingencies and Repairs, - - - 7,742.89

5. Repairs of Railway, - - - - 25,103.63

6. Repairs of Wagons, Coaches, and Locomotives; and contingencies, per returns of the Superintendent of Machinery, - - - - 17,138.58

$156,204.39

[C. No. 5.]

General Statement of the Receipts and Expenses of the Baltimore and Ohio Railroad Company, from the 1st October, 1834, to the 30th September, 1835, embracing the amounts disbursed for Transportation, and for the maintenance and repairs of the Railway, and of Machinery, by the Superintendents, respectively, charged with those departments.

EXPENDITURES.		RECEIPTS.	
Expenses of Transportation, items Nos. 1, 2, 3 and 4, per Table C, No. 4, - -	$113,967.18	REVENUE—viz:	
Repairs of Railway, item No. 5, Table No. 4,	25,103.63	From Passengers, per Table No. 1,	$93,540.22
Repairs of Machinery, item No. 6, Table No. 4, - - - - - - -	17,133.58	" Tonnage, pe do. No. 2,	169,827.88
Net Revenue, ...	107,163.71		
	$263,368.10		$263,368.10

[No. 6.] Abstract of Tonnage transported Eastwardly on the Baltimore and Ohio Rail Road, from the 1st October, 1834, to the 30th September, 1835, inclusive.

Months.	Flour.		Tobacco.		Grain.	Meal, &c.	Provisions.	Live Stock.	Whiskey.	Granite.	Soap Stone	Lime and Lime-stone.	Firewood.	Lumber.	Bark.	Ore & Ochre	Iron	Wool.	Cotton and Cotton Goods.	Leather.	Hardware.	Paper.	Miscellaneous.	Total.
	Bbls.	Weight.	Hhds.	Weight.																				
		Tons.		Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
October,	23,956	2,310.00.2. 7	71	28.14.2. 7	48.13.1.21	212. 0.0.21	2.15.1.14	- -	6. 9.0.0	150. 0.0.0	- -	98. 1.2.00	55.00.1. 0	15. 0.0. 0	17.13.1.0	166.19.3.14	166. 9.0. 7	4. 7.2.14	3,12.0.21	46.14.2. 7	2.14.0. 0	4.16.2. 0	118.11.1. 0	3738.13.0.21
November	27,891	2,692.17.2.00	6	2. 5.2. 0	61.16.1.14	197.16.3.11	3.17.2.00	- -	13.10.0.0	478. 2.0.0	- -	53. 7.0.21	43. 4.3.21	78.13.2. 0	21. 4.0.0	86.12.0. 0	163. 8.2.21	- -	0.15.0. 0	22. 0.2.21	42.13.2. 7	0. 4.0. 0	146.18.0.14	4109. 7.1.21
December,	25,812	2,189. 2.1.14	1	0. 7.2. 0	53. 3.2. 7	143.17.3.21	12. 6.1.00	- -	23.3.1.14	443.17.2.0	2.18.0.0	32.15.1.21	156.19.0. 0	35. 0.0. 0	10.13.2.0	97. 6.3. 0	99. 9.2.14	0. 1.2. 0	- -	16.14.1. 7	23.19.0.14	1.14.0. 0	155. 2.3. 0	3798.12.2. 0
January,	21,269	2,050.18.2.21	13	4.15.3.14	43. 4.1.21	133. 3.1.21	20.00.2.21	- -	13. 9.0.7	98.19.2.0	- -	- -	155.18.0. 0	5. 2.0. 0	- -	18. 1.2. 0	105. 5.2. 0	- -	- -	4. 5.3.21	- -	2.12.0. 0	150. 7.1.14	2806. 4.0. 0
February,	25,716	2,479.15.0.21	5	1.12.0. 0	105. 9.3.21	96.18.1.21	- -	- -	21.13.3.11	293. 4.1.0	- -	1.15.1.21	219.15.0. 0	9.17.2. 0	- -	- -	103.10.2. 0	- -	- -	6.11.0. 7	- -	2. 8.1. 0	144. 2.0.14	3488. 4.0. 7
March,	31,192	3,326.00.2. 7	25	9. 4.0. 0	99. 6.2. 0	125.12.0. 0	7,14.0.00	7. 1.0.0	20.18.1.21	283.19.0.0	- -	33.10.2. 0	460. 4.0. 7	24. 9.0. 0	- -	- -	221.15.1. 7	0. 4.0. 0	- -	26. 0.1.21	- -	0. 7.2. 0	159.16.2.21	4806. 3.0. 0
April,	28,521	2,750. 9.2.14	67	21.16.2.14	87. 4.3. 7	186.10.1.14	- -	3.18.0.0	10. 2.1.21	503. 1.2.0	- -	47. 5.1. 7	19.18.2. 0	49.14.1. 0	2. 5.0.0	251.10.0. 0	261.15.0.14	1. 9.2. 0	6.10.2. 0	36. 1.0. 0	- -	1.18.3. 0	246.10.0.14	4491. 4.1.21
May,	30,009	2,893.12.2. 7	391	146.17.1. 7	123. 4.3. 0	212.16.1.14	2. 6.2.00	- -	28. 8.2.14	756.13.2.0	6. 8.0.0	61.15.0. 0	10. 9.0. 0	38. 7.3.21	25.10.2.0	- -	278.11.0. 0	0.11.0.14	- -	34. 9.1. 0	- -	4. 4.3.21	139. 9.1. 0	4791.15.2.14
June,	12,171	1,173.13.2. 0	405	152.16.0.11	208.16.3. 7	288. 6.3.21	- -	4.13.0.0	28.15.1.11	981.12.1.0	15. 2.0.0	221.13.2. 7	2.14.0. 0	5. 0.0. 0	77.10.0.0	380.11.2. 0	503.11.1.21	2.13.2. 0	- -	15.13.0.21	- -	2. 0.0. 0	144.16.3. 7	4210. 0.0. 0
July,	7,287	702.13.1. 7	358	139.12.2. 7	145. 2.3.21	265.15.0.21	4.00.1.14	- -	11.10.3.11	1,063. 6.0.0	- -	92. 6.0.21	2. 5.0. 0	- -	67.17.2.0	136.12.0. 0	200.17.1.14	6. 4.3. 7	1. 3.1.14	6.16.3. 0	- -	2.14.0. 0	151. 5.1. 7	3000. 3.2. 7
August,	11,759	1,123. 4.2. 0	276	116.12.3.21	298.16.3.11	261. 2.2. 7	- -	- -	16.10.0.7	853.11.2.0	- -	98.17.2. 7	46. 7.0. 0	- -	12. 6.0.0	215.19.2. 0	199.17.0.14	4.15.1. 0	- -	13.19.0.14	- -	1.19.1. 0	155.15.1.21	3722.14.2.21
September,	16,273	1,569. 4.1. 7	688	269.16.0.21	225. 1.0.21	506. 6.1. 7	- -	30.00.0.0	13. 9.2.14	891. 9.0.0	- -	162.19.0. 7	44. 7.0. 0	- -	12.17.0.0	102. 4.0. 0	216.11.2. 7	2. 6.0.14	- -	26. 9.1.21	- -	2. 7.1. 7	120. 9.3.14	3995.18.0. 0
	268,162	25,861.12.2.21	2309	897.11.0.21	1,500. 1.2.11	2,463. 6.2.14	53.00.2.21	15.12.0.0	207.11.3.0	7,097.19.0.0	24.8.0.0.	904. 6.3.00	1,217. 1 5. 0	261. 3.2.21	245.16.3.0	1,455.17.0,14	2,523. 2.1. 7	22.13.1.21	12. 1.0. 7	255.15.3. 0	69. 6.2.21	27. 6.2. 0	1,833. 5.0.14	46,979. 0.2. 0

RECAPITULATION.

Commodities.		Weight.
Flour,	268.162 Barrels	25861.12.2.21
Tobacco,	2.309 Hogsheads	897.11.0.21
Grain,		1500. 1.2.11
Meal,		2463. 6.2.14
Provisions,		53. 0.2.21
Live Stock,		15.12.0. 0
Whiskey,		207.11.3. 0
Granite,		7097.19.0. 0
Soap-stone,		24. 8.0. 0
Lime and Limestone,		904. 6.3. 0
Firewood,		1217. 1.3. 0
Lumber,		261. 3.2.21
Bark,		245.16.3. 0
Ore and Ochre,		1455.17.0.14
Iron		2523. 2.1. 7
Wool,		22.13.1.21
Cotton and Cotton Goods,		12. 1.0. 7
Leather,		255.15.3. 0
Hardware		69. 6.2.21
Paper,		27. 6.2. 0
Miscellaneous		1833. 5.0.14
	Tons.	46.979. 0.2. 0

[D.]

Office of the Department of Machinery of the B. & O. R. R. Co., Oct. 1, 1835.

In making the annual report, of the present amount and condition of Machinery under his care, and also of the improvements in construction, that experience has suggested during the past year, the undersigned begs leave to submit the following, viz:—

There are now in actual service upon the road,

7 Locomotive Engines.
1030 Burden Cars on 4 wheels.
48 Burden Cars on 8 wheels.
44 Passenger Cars, of which 25 are on 8 wheels, the rest on 4 wheels.

Of the 110 Burden Cars ordered by the Board, and put under contract, 48 as above stated, are in actual service. The remainder are in that advancement of progress, that as soon as the wheels and axles and the bolsters can be furnished, they will be ready to be put up and brought into service.

The necessary attention has been paid to keeping all the Machinery in as complete a state of repair as was practicable, and in the construction of that which has been made new during the year, alterations, which experience has demonstrated to be improvements, have been made. The plan adopted of placing the Cars, both for the transportation of passengers and of merchandize, upon 8 wheels instead of 4, together with improvements made in the running gears, appears to be attended with the most happy results. These alterations and improvements, it is confidently believed, will materially tend to the comfort and safety of the passengers, as well as to the preservation of the more tender and perishable articles of commerce. At the same time the interests of the Company will, most probably, be promoted, by the increased durability of the machinery, which will be the necessary result of some, if not of all of these improvements. While it is believed that the machinery on the Baltimore and Ohio Railroad is in as advanced a state of improvement as that of any other Railroad, yet it is not to be presumed that the *neplus ultra* of perfection in the construction is yet reached. All that can be claimed in this respect is, that endeavours have been used to effect an approximation to that point. Farther advances in this career, must be left to the progressive march of invention in mechanical science.

Respectfully submitted,

GEORGE GILLINGHAM,
Supt. of Machinery.

To PHILIP E. THOMAS, *President of Balt. & Ohio Railroad.*

OFFICE OF THE TREASURER OF THE
Baltimore and Ohio Railroad Co.
1st October, 1835.

PHILIP E. THOMAS,

President.

SIR—I respectfully submit my accounts for the last year, together with a statement relative to Real Estate acquired by the Company.

Your obd't. serv't,

W. H. MURRAY, *Treas'r.*

The Baltimore and Ohio Railroad Company,

In Account with William H. Murray, Treasurer.

To balance as per last Annual Report, - -	$39,751.49
Cash paid—	
For Construction, including Graduation, laying Rails, Masonry and Materials, - - -	92,772.05
" Improvements at Depots, including buildings, rail tracks, turnouts, sidelings and water stations, - - - - - -	48,835.69
" Real Estate for purchases of property, -	28,609.83
" Damages and Right of Way, - - -	18.751.69
" Moving Power, say coaches, wagons and horses, - - - - - - -	45,385.08
" Locomotive Engines, - - - -	12,480.08
" Repairs of Road and Machinery, - -	45.121.50
" Patent Rights, - - - - - -	2,524.14
" Engineer Department, - - - -	3.731.00
" Interest to the State and City, and on 6 per cent. Stock for instalments on the Washington Branch, - - - - - - - -	50 369.60
" Instalments on Stock inthe Washington Branch,	469.400.00
" Executors of Robert Oliver, refunded $25 per share, with interest, on 100 shares on which $100 each had been paid, - - -	2,862.50
" Refunded for Forfeited Stock, - - -	379.75

For Law Expenses, for costs, fees, &c. - -	3,159.65
" Contingencies, printing, engraving, taxes, insurance, &c. - - - - - -	1,586.84
" Office Expenses, including salaries, - -	3,425.60
" Expenses of Transportation, - - -	108,179.50
Balance of funds in hand, - - - -	46,237.14
	$1,023,563.13

Cr.—By Cash received—

For Instalments on 29,895 Shares, *a* $5, -	$149,475.00
" 6 per Cent. Stock, applicable to payment of instalments on stock in the Washington Railroad, - - - - - -	500,000.00
" State 5 per Cent. Stock Sold, - - -	50,000,00
" Amount due from Washington Railroad, -	28,406.67
" Old Tents and Instruments sold to B. H. Latrobe, - - - - - - -	400.00
" Storage, - - - - - - -	430.31
" Revenue received for the year ending 30th September, 1835, - - - -	263,368.10
Accounts of disbursing officers, including unsettled balances, - - - - -	31,483.05
	$1,023,563.13

The Baltimore and Ohio Railroad Company—Washington Branch,

In Account Current with W. H. Murray, Treasurer.

To Cash paid—

For Graduation and Masonry, -	$280,716.49
" Construction, including laying rails and materials, - - - - - - -	155,138.83
" Machinery, including Locomotive Engines and Patent Rights, - - - -	15,838,86
" Coaches for Passengers and Baggage, - -	26,143.12
" Right of Way, - - - - -	40,546.90
" Loan refunded to B. & O. R. R. Co. - -	28,406.67
" " " Mechanics' Bank, - -	75,000.00
" Interest, - - - - - - -	5,237.90
" Engineer Department, - - - -	3,147.20
" Law Expenses—costs, fees, &c. - -	2,060.00

To Cash paid—	
For Office Expenses, including salaries, - -	2,005.92
" Contingent Expenses—printing, advertising, &c.	1,056.98
" Expenses of Transportation, - - -	7,982.24
Balance of funds in hand, - - - -	50,520.33
	$693,801.44

Cr.

By balance at the credit of the Company, per last account, - - -	$32,430.96	
By Cash received—		
For instalments on 10,000 shares of Stock, - - -	500,000	
" Sale of Stock received from the State of Maryland, -	103,625.29	
" Revenue from the opening of the Road, to 30th Sept., -	26,689.82	
" Accounts of disbursing officers, including unsettled balances,	31,055.37	
		$693,801.44

The Company have acquired since the last Annual Report, in addition to the real estate heretofore reported, the following pieces of property, viz.

1st. Several squares of land adjoining the Mount Clare Depot, containing altogether about eleven acres, lying between Pratt street and the Washington Avenue, in the city of Baltimore. This property was purchased from Ramsay McHenry. The Depot of the Company at that place, is now enlarged to about 21 acres of land, and is believed to be adequate to all the exigencies of the business there.

2d. A parcel of land on the North side of the Baltimore and Ohio Railroad, extending 40 feet wide around Miller's Narrow, purchased from Peter Miller, on the 12th June, 1835, in order to replace the same quantity belonging to the Chesapeake and Ohio Canal Company, used for the Railroad, around this point.

3d. A parcel of land intended for a Depot, connecting the Railroad with the Canal, at Weverton, conveyed by deed from Caspar W. Wever.

And for the accommodation of the lateral Railroad to Washington, there have been acquired—

1st. Two parcels of land containing near three acres, at the intersection of the Washington Turnpike and Washington Railroad, near to Elkridge Landing, acquired by purchase from Eliphat Parsons and others.

2d. A parcel of land obtained from Joshua D. Brown, near Chandler's Branch, on the 1st section 2d division of the Washington Railroad.

3d. A lot of land containing $9\frac{3}{4}$ acres, from John Haslip, near the Little Patuxent, intended to be used for a sideling, connected with the Savage Factory Railroad, a Water Station, Engine House, &c., for the accommodation of the Washington Railroad. Title acquired by a Decree of the Chancellor, December 1834, recorded in the Chancery Court.

4th. Two parcels of land near Bladensburg, containing between five and six acres, obtained from William Ross by inquisition, January, 1834.

5th. A lot of land adjoining the 1st section 2d division of the Washington Railroad, acquired by purchase from William Worthington.

6th. A lot of land lying on the 2d section 3d division of the Washington Railroad, acquired by deed from Trueman Belt.

7th. Three lots of ground adjoining each other, at the intersection of the Railroad with the Pennsylvania Avenue, near to the western foot of Capitol Hill, in the City of Washington, acquired by purchase from John Sinon and Jeffers. On this property there are erected a convenient three story brick house, now occupied as an office, and also a commodious car house, sufficient for the accommodation of the cars of the Company.

8th. One half of square No. 574, situated directly in the rear of the above last recited property, and connected with it by Second street.

9th. Square No. 632, situated between New Jersey Avenue and C. Capital and K. streets, on which is erected a substantial building for the accommodation of the Locomotive Engines of the Company. There is also on this property, a copious fountain of good water, sufficient for the supply of the Engines and other necessary objects at that place.

10th. Square No. 718, at the intersection of H. street and Delaware Avenue, on which is built a good two-story brick house.

The following Water Stations have also been acquired:

1st. A Water Station at the junction of the Lateral Railroad to Washington with the Baltimore and Ohio Railroad, conveyed by James W. McCulloh and others, trustees.

2d. A Water Station at Avalon, near the 9th mile stone on the Baltimore and Ohio Railroad, conveyed by Thomas Ellicott.

3d. A Water Station near the 12th mile stone on the Baltimore and Ohio Railroad, conveyed by George Ellicott and others.

4th. A Water Station at the 22d mile stone on the Baltimore and Ohio Railroad, conveyed by Thomas B. Dorsey.

5th. A Water Station at Marriottsville, near the 28th mile stone, conveyed by William H. Marriott.

6th. A Water Station on the 2d section 1st division of the Washington Railroad, conveyed by John and Andrew Ellicott.

7th. A Water Station on the 2d section of the 3d division of the Washington Railroad, acquired by deed from Trueman Belt.

In addition to the above enumerated stations, the Company have also secured ample supplies of water for the uses of their Engines, at the following points, viz:

1st. At the Mount Clare Depot.

2d. At Merrill's Ridge.

3d. Near Bladensburgh.

4th. At the Engine House on square No. 632 in the City of Washington.

[F.]

18th June, 1835.

To Jonathan Knight, Esq.

Sir,—Your letter of the 2d May, 1835, has been received, requiring me to make a minute examination into the present condition of the Masonry on the line of the Baltimore & Ohio Rail-road, from its commencement to its termination at Harper's Ferry, together with the actual situation of the wooden viaduct over the Mononcacy, and report thereon respectively.

Pursuant to your instructions, those examinations have been carefully made, and it is with much satisfaction I am enabled to state, that the Masonry on the entire line, with few exceptions, which I will hereafter designate, is of the most permanent character, so much so, that with slight occasional repairs it will endure for ages.

The following statement shews where, and what repairs are necessary, and their probable cost, viz:

4th	Mile—	Bridge Gwynn's Run, some pointing	$4
7	do	Culvert No. 2, part paving to be renewed	2
		do " 4, south end apron necessary	6.
		Bridge No. 1, pointing do	4.
8	do	Bridge No. 2, Gadsby's Run, pointing do	10.
11	do	Bridge No. 1, Dorsey's Run, do	2.
		do " 2, Ellicott's Field, do	2.
		do " 3, Paving and pointing do	116.
13	do	Culvert No. 1, south end apron wanted	3.
14	do	Culvert " 11, portion of paving near s. end	3.
67	do	do No. 2, Capstones broken—No repairs at this time necessary.	
72	do	Culvert No. 3, Poplar Branch, paving and piece to be repaired	6.
73	do	Bridge No. 1, Sugar Tree Branch, end of south east wing requires repaving	15.
		Bridge No. 2, Greater Catoctin, paving necessary,	2.
74	do	Bridge No. 1 Clagett's Branch, do	2.
77	do	Culvert No. 2, Piece to be repaired	3.
			180

Making together the sum of one hundred and eighty dollars, as the aggregate cost of all the repairs deemed necessary to place the Masonry in a sound condition, which allowance, it is confi-

dently believed, is amply sufficient to effect the purpose, provided the work be executed under the directions of the supervisors on the road.

It is proper to remark, that the greater part of those repairs might be, at present, dispensed with, as for instance the pointing of the several viaducts, together with the paving of Viaduct No. 3, on the 11th mile. I would however recommend that all the repairs mentioned be now made.

59th Mile—The Monococy Viaduct on this mile appears in good order, except that a slight repair to the weather boarding on the north side is necessary.

Respectfully submitted, ROBERT WILSON,
Assistant Sup'dt. Masonry.

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UNIV. OF MD. COLLEGE PARK

JUN 76
N. MANCHESTER,
INDIANA